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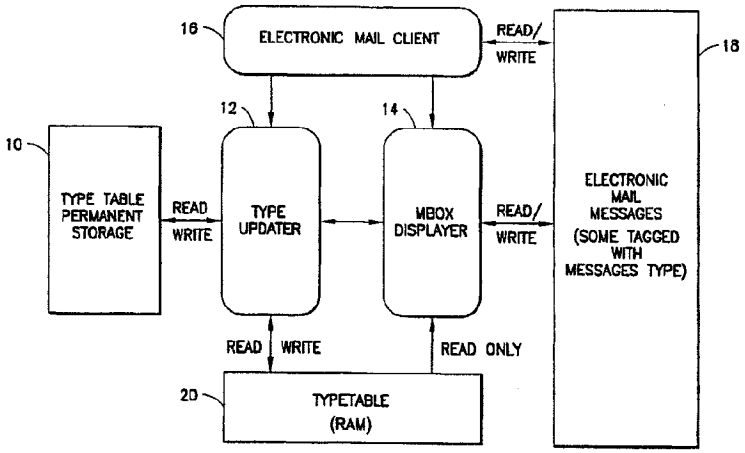
(54) Title: ENHANCED ELECTRONIC MAIL SYSTEM INCLUDING METHODS AND APPARATUS FOR IDENTIFYING MIME TYPES AND FOR DISPLAYING DIFFERENT ICONS



(57) Abstract: Electronic mail client software (16) has a mailbox displayer (14) which lists messages together with an icon for each message where the icon is associated with the MIME type of the message. Mail which contains file attachment (18) is listed in the inbox with an icon indicative of the type of file attached to the mail. The mailbox displayer interprets the MIME type and selects the appropriate icon either from the icon registry in the OS or from a directory of icons maintained by the email client software. If there is no appropriate icon in the directory of icons, the mailbox displayer uses icon image data contained in a subpart of the MIME message if it is available. Otherwise, no icon or a generic icon is used. According to the presently preferred embodiment, a type table (20) is maintained by a type updater (12) component. The type includes a list of message types and subtypes together with filenames of scalable icons to be used by the mailbox displayer.

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ENHANCED ELECTRONIC MAIL SYSTEM INCLUDING METHODS AND APPARATUS FOR IDENTIFYING MIME TYPES AND FOR DISPLAYING DIFFERENT ICONS

This application is a continuation-in-part of application serial number 09/209,162 filed December 10, 1998, the complete disclosure of which is hereby incorporated by reference herein. This application is related to copending application serial number [BAK-007] filed simultaneously herewith, the complete disclosure of which is also hereby incorporated by reference herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an electronic mail program. More particularly, the invention relates to an electronic mail program having a mailbox browser display which displays different icons for different types of mail item MIME types.

2. State of the Art

In recent years electronic mail ("email") has become widely used in business, education, and in personal communications. One of the features of electronic mail which is most convenient, particularly in business and in education, is the ability to attach a binary computer file to an email message. This feature enables email correspondents to rapidly share word processing documents, database documents, spreadsheet documents, multimedia documents, or virtually any kind of binary file created by a computer. There are, however, some serious limitations and inconveniences associated with attaching a binary file to an email message.

The original Internet mail system as defined in 1982 with RFC (Request for Comments) 821 and 822 had a number of important limitations. In particular, the system was not designed to carry large quantities of arbitrary data in an email message. In fact, the 1982 SMTP (Simple Mail Transport Protocol) standard required that an email message consist of a single message containing only ASCII characters in lines of 1000 characters (blocks of 32k) or less.

The ability to send binary data through the Internet electronic mail system was made possible with the MIME (Multipurpose Internet Mail Extensions) standard for Internet messages. The original MIME standard was published as an Internet Request For Comments document (RFC 1341) and approved in June of 1992. (See Internet RFCs 2045,2046, and 2047

for the latest MIME standards documents.) The MIME standard describes how an email message should be formatted in order to be considered MIME compliant. MIME defines a set of message header fields and a set of message encoding standards that are designed to overcome the limitations of RFC 822 message formats and still be transportable through any of the numerous legacy mail transport systems in use on the Internet. (See specifically, N. Freed and N. Borenstein, Multipurpose Internet Mail Extensions (MIME) Part 1: Format of Message Bodies, Network Working Group, Request For Comments (RFC 2045) November 1996.) MIME message header fields extend those defined in RFC 822 and describe the content and encoding type of the email message. Encoding schemes allowed in the MIME standard include "quoted-printable", and "base64". In addition, three unencoded data types are allowed. These are labeled "8bit", "7bit", or "binary". It should be noted that legacy gateways still do not handle binary data and nearly all MIME compliant messages encode binary data as "7bit", the default encoding for MIME.

Today MIME is implemented in all of the major electronic mail clients or "User Agents", e.g. Microsoft Outlook and Outlook Express, Netscape Communicator, and Qualcomm Eudora. However, only a few MIME types including "text/plain", "text/html", "multipart/alternative", and "multipart/mixed" can be handled by these programs. Probably the most important feature of the MIME standard that was that it allowed any binary data to be appropriately encoded and sent through the older SMTP system of mail gateways and exchanges. Mail client programs such as those listed above were modified to allow users to attach any type of file to a mail message. This was done by (a) including an appropriate encoding module to translate the binary data of an arbitrary file to an acceptable MIME encoding such as "7bit" or "base64", (b) expanding the Mail client's ability to handle messages with a MIME type set to "multipart", and (c) including the file specified by a user as a part of the "multipart" message. For many years, mail client programs offered users only the two choices; they could send a simple text message (sent with "content-type = text/plain") or they could attach any file to a simple text message (sent with "content-type = multipart/mixed").

More recently the programs listed above have been extended to allow authors to use basic types of text formatting such as alternative fonts and styles by including these features in the mail client text editor and sending the message with a MIME type set to "text/html". Today Microsoft's Outlook even allows a person to use Word, a full featured text editor, to author electronic mail messages by converting the Word file format to HTML before manually inserting it into the body of the mail message for sending. Nevertheless, mail client programs

still rely exclusively on file attachments with message MIME types set to "multipart" for any other type of file format.

If the sender and the receiver of the email message with the attached binary file are using the same brand and version of email program and both programs are configured in substantially the same way, the receiver's email program should automatically apply the appropriate decoding to the attached binary file and produce a file which is identical to the file which was attached to the email by the sender. However, if the sender and receiver are using different email programs, the recipient may receive a file which must be decoded by the recipient using a separate decoding program.

Even after the file is properly received and decoded, it is often difficult for the receiver of the file to open the file. The receiver of the file might expect that "clicking" on the file icon will open the file. However, clicking on the file icon will often not open the file. It may result in an error message like "application not found" or, worse, it may result in the file being opened by an inappropriate application thereby displaying "gibberish". The receiver of the file must have a program capable of reading (opening) the file. For example, if one attaches a spreadsheet file to an email message, the receiver of the file must have a spreadsheet program in order to open the file. Technically, it is not necessary that the receiver of the file have the same brand program as that which created the file. However, opening a file with a program which did not create it, though possible, can be very inconvenient. The receiver of the file must know what kind of file is attached to the email message, must know what program on their computer is capable of reading that type of file, must launch the program, must open the file from within the program, and wait while the program translates the file.

The limitations of Internet electronic mail can become even more frustrating if the sender and recipient are not using the same operating system (OS). Some mail attachment encoding schemes (and file compression schemes) are OS-dependent and it is possible that an email recipient could receive a file which is impossible to decode (or decompress).

These limitations in electronic mail have discouraged many people, particularly non-sophisticated computer users, from attaching files to electronic mail messages. In fact, for some novice users, the task of launching one application to create a document, saving the document, launching a separate email application to create an email message, and then locating the saved document for attachment to an email message is daunting enough to discourage them. In

addition, novice users often complain that after "downloading" a file attached to an email message they cannot find the file on their hard disk.

Most email client software allows the user to sort items in the inbox by sender, subject, or date in order to locate more easily a particular mail item. In addition, most email client software indicates whether a particular message includes an attached file. This is indicated by an icon such as a paper clip icon or a generic document icon or a floppy disk icon, for example. However, the same icon is used regardless of the nature of the attachment and there is no way of knowing the nature of the attachment until the message is opened. Prior art Figure 1 shows an example of a typical email inbox where some of the mail items have attached files indicated by the paper clip icon to the left of the subject name. Though not specifically shown in Figure 1, those skilled in the art will appreciate that generic icons, such as !, a, Â , 4, etc., may also be displayed alongside the message subject to indicate various "properties" of the message, such as whether it is a high priority message, whether you have already replied to the message, etc. These generic icons are usually monochromatic font characters taken from a "dingbats" font or the like.

In the most recent versions of the major email client programs, an icon that represents the file type of an attached file is displayed in the body of the mail message after the message is opened by the user. This is possible because computer operating systems such as Microsoft Windows or Macintosh OS maintain data that associates information with each file type known to the system. This information includes a graphical icon and the location of programs that may be used to "open", "edit", or to perform a handful of other actions on the file. For example, in Microsoft Windows the system registry includes entries for each file type that is known to the system and at least some of the information described above is associated with the file type. When a user opens an electronic mail message with "content-type = multipart/mixed", a mail client program built for Microsoft Windows (e.g. Microsoft Outlook) determines that the second part of the message was an attached file, identifies a line of text within the message such as, Attachment Converted: "c:\attach\aFile.doc", looks in the system registry for the icon associated with the file type ".doc", and displays the graphical icon inside the body of the message.

In current systems, MIME type is not used to associate icons to files, rather the file type extension is used. This creates important limitations in the ability to associate different versions of software or documents created by different versions of the software with different icons. For example all documents created by MS Word, regardless of which version of Word was used,

have the same file type (file extension) and as a result are associated with the same icon. This is true even though many newer versions of the files cannot be read by older versions of the software.

My previously incorporated parent application discloses electronic mail software which includes a main email component and a number of installable components. The installable components include authoring/reading components for creating/reading different kinds of documents and mailbox components for listing different kinds of messages or for listing messages in different styles. The main email component provides an underlying graphical user interface for functions directly associated with the storage and transfer of electronic mail messages, and also handles all data bundling and unbundling required to transform a message created by an authoring component into a MIME compliant message. The authoring/reading components act like applications embedded within the email program and allow specific types of documents such as spreadsheets, graphics, databases, etc. to be created from within the email program and emailed directly. The authoring/reading components also allow received documents to be read without the difficulties traditionally associated with attaching binary files to an email letter. The authoring components of the invention pass data to the main email component which packages the data as a MIME compliant message. When the message is received, the main email component concatenates (as needed) and decodes the MIME message and sends the data to the authoring/reading component associated with the MIME type.

My previously incorporated parent application broadly disclosed and claimed mailbox handling software whereby messages of different types are displayed in different ways in a mailbox listing within the context of the modular component email software.

It is believed that certain features disclosed in my parent application are applicable to any email client software and may be used to improve the process of attaching files to email and using files attached to email.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide an electronic mail program which includes an inbox list whereby different kinds of messages and attached documents are displayed with different kinds of icons.

In accord with this object which will be discussed in detail below, electronic mail client software according to the invention has a mailbox displayer which lists messages together with an icon for each message where the icon is associated with the MIME type of the message. Mail which contains a file attachment is listed in the inbox with an icon indicative of the type of file attached to the email. The mailbox displayer interprets the MIME type and selects the appropriate icon either from the icon registry in the OS or from a directory of icons maintained by the email client software. For example, if an email with an ADOBE ACROBAT file attachment is received, the ADOBE ACROBAT icon will appear in the mailbox listing alongside the mail item listing. In addition, if a message is created with a special authoring/reading component as described in my parent application, the icon associated with the authoring/reading component will be displayed in the mailbox listing as part of the line displaying the mail item.

The electronic mail software of the present invention is described by example with reference to the email software of my parent application which includes a main email component and a number of installable components which communicate bidirectionally with the email component through an application programming interface (API). The installable components include authoring/reading components as well as a mailbox displayer component. According to the presently preferred embodiment, a component is also included for maintaining a database of icons.

The mailbox displayer component functionality is invoked by the user when the mailbox is opened, when the list of mail is scrolled, etc. The mailbox displayer component preferably includes all of the functionality of state-of-the-art mailbox displayers and includes the functionality of looking to a directory of icons for display with information about the message based on the MIME type of the message. In the Lingo embodiment, a data structure is created for each message with an additional TYPE field that is based on the MIME type and subtype of the message. The internal TYPE field is used to associate MIME types to icons. Another embodiment uses the contents of "content-type" (MIME type) header of the message directly to associate with icon images. If there is no appropriate icon in the directory of icons, the mailbox displayer uses icon image data contained in a subpart of the MIME message if it is available. Otherwise, no icon or a generic icon is used. According to the presently preferred embodiment, a type table is maintained by a type updater component. The type table includes a list of message types and subtypes together with filenames of scalable icons to be used by the mailbox displayer. The invention prefers scalable icons so that the icon can be sized to accompany the font size chosen to display the mailbox contents.

Several embodiments of the type updater component are provided. According to the first embodiment, icons are installed/removed manually by the user. According to a second embodiment, icons are automatically installed/removed when modular authoring/reading components are installed/removed. According to a third embodiment, new icons are added automatically whenever a new message type is encountered by the mailbox displayer. The new icon is retrieved from either the operating system registry or from the icon image data embedded in the message. According to a fourth embodiment, the type updater automatically queries a network server for new icon information and downloads icon image data as needed.

Additional objects and advantages of the invention will become apparent to those skilled in the art upon reference to the detailed description taken in conjunction with the provided figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a screen shot of a prior art electronic mailbox displayer;

Figure 2 is a screen shot of an electronic mailbox displayer according to the invention;

Figure 2a is a screen shot of an electronic mailbox displayer according to an alternate embodiment of the invention;

Figure 3 is a block diagram of the component organization of an electronic mail client according to the invention;

Figure 4 is a simplified flow chart illustrating the basic operation of a mailbox displayer according to the invention;

Figure 5 is a simplified flow chart illustrating the basic operation of an alternate embodiment of the mailbox displayer according to the invention;

Figure 6 is a simplified flow chart illustrating icon lookup for different mail item properties;

Figure 6a is a simplified flow chart illustrating icon lookup for MIME type;

Figure 6b is a simplified flow chart illustrating icon lookup for filetype of attachments;

Figure 7 is a simplified flowchart illustrating the initialize_TypeTable function of one embodiment of the type updater component;

Figure 8 is a simplified flowchart illustrating the read_TypeTable_file function of one embodiment of the type updater component;

Figure 9 is a simplified flowchart illustrating the write_TypeTable_file function of one embodiment of the type updater component;

Figure 10 is a simplified flowchart illustrating the read_icon_files_to_RAM function of one embodiment of the type updater component; and

Figure 11 is a simplified flowchart illustrating the install_Type function of one embodiment of the type updater component.

BRIEF DESCRIPTION OF THE APPENDICES

Appendix A is a program listing for MACROMEDIA DIRECTOR of a mailbox displayer according to the invention; and

Appendix B is a program listing for MACROMEDIA DIRECTOR of a type updater according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figure 2, electronic mail client software according to the invention has a mailbox displayer which lists messages together with an icon for each message where the icon is associated with the MIME type of the message. Mail which contains a file attachment is listed in the inbox with an icon indicative of the type of file attached to the email. For example, as shown in Figure 2, the mail message entitled "Minutes of Meeting" is listed with a MICROSOFT WORD icon indicating that the email message has a WORD file attached to it. The message entitled "New Radio Ad" is listed with a QUICKTIME WAV icon indicating that an audio file is attached to the email. The message entitled "New Ad Brochure" has an attached ADOBE ACROBAT file as indicated by the ACROBAT icon. Similarly, the message

"Sales Forecast" is displayed with an EXCEL spreadsheet icon; the "Customer Database" message is displayed with a FILEMAKER PRO database icon; and the message "Year End Accounting" is displayed with a QUICKEN icon. According to the invention, the mailbox displayer interprets the MIME type of the message and/or the MIME type or document type of the attachment, if any, and selects the appropriate icon either from the icon registry in the OS or from a directory of icons maintained by the email client software.

The electronic mail software of the present invention is described by example with reference to the email software of my previously incorporated parent application which includes a main email component and a number of installable components which communicate bidirectionally with the email component through an application programming interface (API). The installable components include authoring/reading components as well as at least one mailbox displayer component. Figure 2a illustrates an embodiment of the email software of my previously incorporated parent application which displays an icon indicative of the authoring/reading component associated with the mail message. This embodiment is also capable of receiving email from (and sending email to) prior art email clients. Figure 2a illustrates a mailbox list where two mail items are shown with two icons, i.e. a paper clip and an ACROBAT icon and a paper clip and a PHOTOSHOP icon. The dual icon display indicates that the mail was created without any special authoring/reading component and has an attachment created by some other program, in this case ACROBAT and PHOTOSHOP.

As mentioned above, the electronic mail software of the present invention is described by example with reference to the email software of my previously incorporated parent application which includes a main email component and a number of installable components. According to the presently preferred embodiment, a component is also included for maintaining a database of icons. Figure 3 illustrates the relationship between these components.

As shown in Figure 3, a data structure 10 referred to as TYPETABLE is created and maintained by a component 12 referred to as TYPE_UPDATER. A working example of a TYPE_UPDATER according to the invention is illustrated in Appendix B which is described in more detail below. The primary purpose of the TYPETABLE is to be read by the MBOX_DISPLAYER component 14. The TYPE_UPDATER 12 and MBOX_DISPLAYER 14 communicate with each other using function calls and a shared data structure, TYPETABLE. For example, the MBOX_DISPLAYER includes a call to the function "initialize TYPETABLE" (306, Figure 6a) inside the TYPE_UPDATER component. The MBOX_DISPLAYER communicates with the electronic mail client software using the API described in the parent

application and or in previously incorporated serial number [BAK-007]. As shown in Figure 3 the MBOX_DISPLAYER component 14 and the electronic mail client software 16 also have bidirectional access to the store of electronic mail messages in the user's mail boxes. According to the presently preferred embodiment, the electronic mail messages are stored with an optional TYPE field which includes information drawn from the MIME type and subtype header fields of the message if the message is created by an installable application component of the kind described in the parent application.

The MBOX_DISPLAYER component functionality is invoked by the user when a mailbox is opened, when the list of mail is scrolled, etc. Those skilled in the art will appreciate that most electronic mail client software provides a number of different mailboxes such as inbox, outbox, read mail, sent mail, etc. The MBOX_DISPLAYER component 14 preferably includes all of the functionality of state-of-the-art mailbox displayers and also includes the functionality of looking to the TYPETABLE (and as explained in more detail below, to look into the body of a MIME message) to find an appropriate icon for display alongside a message title in the mailbox display. According to the presently preferred embodiment, icons are stored as small image files, e.g. EPS files or GIF files, and are pointed to by the TYPETABLE data structure. In order to accommodate the use of different size fonts in the mailbox display, means for scaling the size of the icon graphics are also provided. Three methods may be used. First, the image may be scaled using a standard interpolation algorithm. Second, multiple copies of icon images with different resolutions may be stored and retrieved to match a limited number of font point sizes. Third, and presently preferred, a combination of the first two methods is used whereby at least one image for each icon is stored, the icon most closely matching the point size of the font is chosen and then scaled as needed to better match the font point size.

Table 1 illustrates how the TYPETABLE data is stored in permanent storage (e.g. hard disk).

mimetype	icon filename	msg handler filename
text/plain	c:\kidcode\text.gif	c:\kidcode\txt.dxr
x-application/ rebus	c:\kidcode\rebus.gif	c:\kidcode\rebus.dxr
x-application/grid	c:\kidcode\grid.gif	c:\kidcode\grid.dxr
x-application/graph	c:\kidcode\graph.gif	c:\kidcode\grph.dxr
...	...	...
multipart/mixed	c:\kidcode\paperclip.gif	

Table 1

Table 1 illustrates at least five mimetypes. The first four are mimetypes which utilize installable components for authoring/reading. The installable components are indicated by the ".dxr" file extension. The multipart/mixed (fifth) mimetype illustrated in Table 1 indicates an attachment created with an external application rather than an installable component. As mentioned above with reference to Figure 2a, a generic paper clip icon is used to distinguish this attachment from mail messages created with installable components.

Table 2 illustrates the typetable data structure as it is loaded into RAM.

mimetype	ptr	icon filename	msg handler filename
text/plain	20	c:\kidcode\text.gif	c:\kidcode\txt.dxr
x-application/ rebus	21	c:\kidcode\rebus.gif	c:\kidcode\rebus.dxr
x-application/grid	22	c:\kidcode\grid.gif	c:\kidcode\grid.dxr
x-application/graph	23	c:\kidcode\graph.gif	c:\kidcode\grph.dxr
...		...	...
multipart/mixed	19	c:\kidcode\paperclip.gif	

Table 2

When the data structure TYPETABLE is loaded into RAM it is referred to as SG_TYPETABLE and has a structure as shown in Table 2. This structure includes a pointer to the icon. The pointer in the exemplary embodiment is a LINGO castmember.

As mentioned above, according to the exemplary embodiment, when the email message has an attached file, a generic attachment icon is displayed and an icon particular to the attachment is also displayed. This second icon is pointed to by a data structure in RAM which is created on the fly (e.g. as illustrated in Figure 6b) referred to as SG_ATTACH_TYPETABLE. The basic structure of SG_ATTACH_TYPETABLE is illustrated in Table 3.

File Extension	icon pointer	program filename
.doc	30	c:\programs\winword.exe
.pdf	31	c:\programs\acrobat.exe
.html	32	c:\programs\netscape.exe
.htm	32	c:\programs\netscape.exe
.xml	32	c:\programs\netscape.exe
...	...	...

Table 3

As shown in Table 3, the file extension is associated with an icon pointer and the pathname to the program which will be used to read the attachment. As discussed in more detail below with reference to Figure 6b, the SG_ATTACH_TYPETABLE is built on the fly using icons from the system registry.

A presently preferred embodiment of a MBOX_DISPLAYER component is presented in detail in Appendix A which is similar to Appendix B of my previously incorporated parent application. The code listing shown in Appendix A hereto differs from the code listing of the parent application starting at line 287 which is the start of the main mailbox display function. The main mailbox display function is also illustrated by the flowchart of Figure 4 Referring now to Figure 4 and Appendix A, the function starts at line 287 in Appendix A and at the START 101 in the flowchart of Figure 4. Before displaying the mailbox contents, pointers to the TYPETABLE and associated system features are set up as illustrated at lines 293-300 in Appendix A and at 103, 105 in Figure 4. The various mailbox fields, e.g. message number,

subject, date, message read indicator, are cleared at lines 302-307 in Appendix A and at 107 in Figure 4. "Sprite channels" (MACROMEDIA graphic holders) which will be used to display icon graphics are cleared at lines 309-311 in Appendix A and at 107 in Figure 4. Next the message list is displayed starting at line 313 in Appendix A and at 109 in Figure 4. The elements which make up each line of the mailbox display (e.g. the message subject, the date, the sender's name, as well as the graphical elements) are referred to as "properties". These properties are read from the message at lines 320-326 in Appendix A and at 111, 113 in Figure 4. With the exception of mailbox, mimetype, and status, all of the properties are automatically displayed when read as illustrated at 111 in Figure 4 and lines 320-323 in Appendix A. The mailbox, mimetype, and status properties are read at 113 in Figure 4 and lines 324-326 in Appendix A. According to the presently preferred embodiment, the mimetype icon is also used to display message status. If the message has been read, the icon is displayed in greyscale. If the message has not been read, the icon is displayed in color. The steps of finding the icon and setting it to greyscale or color are illustrated at lines 328-355 of Appendix A. The sprite channel counter is set at lines 332-334 in Appendix A and at 115 in Figure 4. The TYPETABLE data structure is parsed at lines 340-343 in Appendix A and at 117 in Figure 4. If the TYPETABLE does not contain the icon indicated by the mimetype for this message, then a default icon is chosen at lines 344-346 in Appendix A and at 119 in Figure 4. If the status for the message indicates that it (its attachment) has been read, then the greyscale version of the icon is set at lines 348-349 in Appendix A and at 121 in Figure 4. The chosen icon is added to an icon list for rapid access during scrolling of the mailbox contents list. This is illustrated at lines 351-352 in Appendix A and at 123 in Figure 4. The remainder of the main mailbox display function at lines 354-374 in Appendix A and at 125 in Figure 4 concern locating the text and icons at appropriate screen locations. The code shown at lines 315-374 repeats for the number of messages in the mailbox as illustrated by the decision at 127 in Figure 4. When there are no more messages to be listed, the main mailbox display function ends as illustrated at 376 in Appendix A and 129 in Figure 4.

Though not presently illustrated in the code or flowchart, as mentioned above, if there is no appropriate icon in the directory of icons, the mailbox displayer uses icon image data contained in a subpart of the MIME message if it is available. Those skilled in the art will appreciate that this functionality is easily performed by reading the icon image data from the location in the MIME file which is defined by the standard(s) referenced above. Code to implement this might be inserted at line 325 of Appendix A or at line 345 of Appendix A.

As mentioned above, the remainder of Appendix A is substantially the same as the mailbox component of Appendix B of the parent application and the description of it is adequately set forth in the previously incorporated parent application. Those skilled in the art will appreciate that the code listings of the Appendices are particular to the MACROMEDIA DIRECTOR development suite and that the same functionality may be achieved using a different development environment. Figure 5 illustrates the functionality of the mailbox display function in a more generic manner which can apply to different programming languages.

Referring now to Figure 5, the mailbox display starts at 201 to read the list of messages. It checks at 202 to determine whether the TYPETABLE has been initialized. If it has not, the TypeTable is initialized at 204 as described in detail below with reference to Figure 7. The mailbox display gets the next message listing at 203. For the message listing obtained at 203, the mailbox proceeds to obtain properties for the listing at 205 and property values at 207. If it is determined at 209 that the property uses an icon for display, a "get icon" routine is called at 211 (this routine is illustrated at Figure 6). The message properties that concern the present application are (a) the message MIME type and (b) whether the message has a file attachment. In the flow charts in Figure 5 (209) the system looks up whether current message property which is implemented as a LINGO symbol, e.g. #type, #date, #mailbox, #status, is represented by an icon. Although in the current implementation, each property is coded separately, the more general implementation described in the flowchart of Figure 5 could be accomplished by checking whether the target symbol, e.g. #type was an element of a list data structure, e.g. Properties_with_Icons = (#type, #has_attachment) in procedure 209 of Figure 5. The icon is displayed at 213. If it was determined at 209 that the property does not use an icon, the property value is displayed at 215. At 217 it is determined whether there are additional properties for this message listing. If there are, the program returns to 205. If there are not, it is determined at 219 whether there are more message listings to list. If there are, the program returns to 203. If there are not, the program ends at 221.

Figure 6 illustrates a generalization of the functionality contained in Appendix A at lines 328-350. This is the generalized "get icon" routine called at 211 in Figure 5. The routine starts at 301 having been provided the property name and property value by the calling program. If it is determined at 303 that the property is "mimetype" or, to conform to the LINGO implementation, "#type", the icon of the mimetype is obtained at 305 and a pointer to the icon is passed back to the calling program at 307. The actual steps involved in getting the icon for a mimetype are illustrated in Figure 6a. If it is determined at 309 that the property is "has attachment", the icon for "has attachment" is obtained at 311 and a pointer to the icon is passed

back to the calling program at 307. The procedure that gets the file attachment icon is described in Figure 6b for a Microsoft Windows platform. Alternatively, the TYPETABLE data structure could include a field for filetype that is used to map from file extensions to MIME types and MIME type icons. If TYPEDATA were modified in this way, both message type and file type icon lookups would use the TYPETABLE. A related modification in the TYPE_UPDATER would be required to install the filetype/MIMEtype associations as they are encountered either via a previously unknown message type or a previously unknown file type. Because file type extensions are not as rich as Mimetypes, the same file type extension may map to many different MIME types. For example this could occur for different versions of the same software if the software manufacturer assigns different MIME subtypes for different versions of their software.

If it is determined at 313 that the property is "message read", the icon for "message read" is obtained at 315 and a pointer to the icon is passed back to the calling program at 307. If it is determined at 317 that the property is "priority", the icon for "priority" is obtained at 319 and a pointer to the icon is passed back to the calling program at 307. From the foregoing, those skilled in the art will appreciate that many different icons can be displayed for different properties.

Figure 6a illustrates a generalization of the implementation contained at lines 328-346 of Appendix A. This is the "get icon for mimetype" function called at 305 in Figure 6. This routine starts at 302 having been given the "mimetype" by the calling program. It determines at 304 whether the TYPETABLE has been initialized. If not, initialization is performed at 306. The initialization routine may reside in the TYPE_UPDATER component or may call functions that reside in the TYPE_UPDATER component. For example, in the LINGO implementation, the function Read_TypeTable_File (Figure 8), which is part of the TYPE_UPDATER component is used to initialize the TYPETABLE data structure. After initialization, or if it was determined at 306 that the TYPETABLE was already initialized, the mimetype is used to retrieve an icon pointer from the TYPETABLE at 308. See Appendix A, lines 328-342. It is determined at 310 whether the icon pointer is null. If it is, an "install message type" routine is called at 312. The "install message type" routine, which is contained in the TYPE_UPDATER component, is explained in detail below with reference to Figure 11which illustrates the installation of new message handlers and icons for mimetypes. If the icon pointer is not null, it is determined at 314 whether the icon pointer points to "icon not installed". If that is the case, the icon pointer is set to the default pointer at 316. In either case, a non-null pointer is returned to the calling program at 318.

Figure 6b illustrates an exemplary procedure for getting an icon for an attachment to an email message. Starting at 320, the file extension of the attachment is read. (Note that on a Windows platform, the three letters following "." in a filename determine the "filetype". With other platforms, such as the Macintosh platform, the filetype and "creator code" are listed in the "resource fork" of the file. Thus, for those platforms, the first step will be to read the filetype (and creator code) from the resource fork of the file.) Once the filetype (or filetype and creator code) have been determined, the routine attempts at 322 to find an appropriate icon in the SG_TYPETABLE. If it is determined at 324 that no appropriate icon has been found, the routine attempts at 326 to find an appropriate icon in the SG_ATTACH_TYPETABLE. If it is determined at 328 that no appropriate icon has been found, the routine attempts at 330 and 332 to find an appropriate icon in the system registry. (Note that with other operating systems, icon resources may be stored in different places. E.g., in the Macintosh OS, icon resources are stored in the invisible "desktop" file.) If at 334 a suitable icon is found, a pointer to the icon is set at 336 and the pointer is written to the SG_ATTACH_TYPETABLE at 338. The icon pointer is returned to the mailbox displayer at 340. See 311 in Figure 6 and 211 in Figure 5. If a suitable icon is not found at 342, no icon pointer is provided.

Turning now to Appendix B, lines 1-26 provide an overview and introduction to the Type Updater. The Type updater includes eleven functions. Three of the them are public functions called by the mailbox displayer. These include: Initialize_TypeTable, Install_Type, and Uninstall_Type. The remaining eight functions are private functions used within the Type Updater. These include: Write_Typetable_File, Read_Typetable_File, Read_Icon_Files_To_RAM, read_iconFile, delete_mimetype, insert_mimetype, delete_filetype, insert_filetype. The Initialize_TypeTable function is illustrated in Figure 7 and at lines 29-60 in Appendix B. The function begins at 360 in Figure 7, sets the SG_TYPETABLE to nil at 362 (line 39 in Appendix B). The SG_ATTACH_TYPETABLE is set to nil at 364 (line 43 in Appendix B). The Typetable file stored on disk is read into SG_TYPETABLE at 366 (line 44 in Appendix B). The read_typetable_file internal function is illustrated in Figure 8 and at lines 207-252 in Appendix B. An error check is performed at 368 (line 46 in Appendix B) to determine whether any data was loaded into RAM. If no data was read, the user is alerted at 370 (line 47 in Appendix B) and a failure is returned at 372 (line 48 in Appendix B). Otherwise, icon files are read into RAM at 374 (line 51 in Appendix B). An error check is performed at 376 (line 47 in Appendix B). If the data was read successfully, the function ends at 378 (line 60 in Appendix B).

Turning now to Figure 8 and at lines 207-252 in Appendix B, the read_typetable_file function starts at 380 (line 218 in Appendix B). The SG_TYPETABLE is set to nil at 382 (line 222 in Appendix B). The typetable.txt file is opened at 384 (lines 224-227 in Appendix B) and a file open error check is performed at 386 (line 229 in Appendix B). If an error in opening the file is detected, an error alert is produced at 388 and (line 230 in Appendix B), the file is closed at 390 (line 231 in Appendix B), and a SG_TYPETABLE is returned at 392 (line 232 in Appendix B). If the file was opened without error, the first line is read at 391 which begins a loop (steps 394-408) which ultimately ends at 394 when the end of file is reached after which the file is closed at 390 (line 231 in Appendix B), and a SG_TYPETABLE is returned at 392 (line 232 in Appendix B). As shown in Appendix B at lines 235-239, the LINGO implementation reads the entire file into a string and simulates line by line reading because LINGO cannot read line by line. When a line is read, the first word in the line is the mimetype (line 243 in Appendix B). The mimetype is inserted into SG_TYPETABLE at 396 (line 244 in Appendix B). If the mimetype is not defined as discovered at 398, the user is alerted at 400 and the next line is read at 391. If the mimetype is defined, the next word in the line (filetype) is read and inserted into SG_TYPETABLE at 402 (line 245 in Appendix B). The next word in the line (iconFileName) is read and inserted into SG_TYPETABLE at 404 (line 246 in Appendix B). The next word in the line (msgHandler) is read and inserted into SG_TYPETABLE at 406 (line 247 in Appendix B). Any errors detected at 408 are reported at 400. As mentioned above, the process continues until the typetable.txt file is completely read.

The function Write_TypeTable_File is described in Figure 9 and at lines 159-206 of Appendix B. This function writes the contents of SG_TYPETABLE back to typetable.txt after new mimetypes and icons have been added to the SG_TYPETABLE via the Install_Type function described below with reference to Figure 11. The Write_TypeTable_File function begins at 410 (line 163 in Appendix B) and first checks at 412 (line 168 in Appendix B) whether the SG_TYPETABLE structure is empty. If it is empty, it returns an error message at 414 (line 169 in Appendix B) and a failure message at 416 (line 170 in Appendix B). If the SG_TYPETABLE structure is not empty a backup copy of the typetable.txt file is created at 418 (line 173 in Appendix B) and a new empty file is created at 420 (lines 176-180 in Appendix B). An error check is performed at 422 (line 181 in Appendix B) and if an error is detected in creating the new file, an error message is returned at 424 (line 182 in Appendix B). The backup file is restored at 426 (line 183 in Appendix B) and a return code is set to "fail" at 428 (line 184 in Appendix B). The typetable.txt file is closed at 430 (line 203 in Appendix B). The backup is deleted at 432 (line 204 in Appendix B) and the return code is returned at 434 (lines 205-206 in Appendix B). If there is no error creating the new file, it is opened for write access at line 187-

188 in Appendix B and a starting line counter is set at line 191. The first (next) entry in the SG_TYPETABLE is read at 436 (line 192 in Appendix B). If it is determined at 438 (line 193 in Appendix B) that the end of SG_TYPETABLE has been reached, the return code is set to "success" at 440 (line 201 in Appendix B), the file is closed 430, the backup is deleted 432 and the return code is returned 434.

Until the end of SG_TYPETABLE is reached, data is set to write at 442 and the mimetype is written at 446 (line 194 in Appendix B) to a string. The filetype, iconfilename, and messagehandlerfilename are added to the string at 446, 448, and 450 respectively (lines 195-197 in Appendix B). The string is written to the new typetable.txt file at 452 (line 198 in Appendix B) and a line delimiter is written at 454 (lines 199-200 in Appendix B). The function loops back to 436 and continues until all of the entries in SG_TYPETABLE are read and written to the new typetable.txt file.

Figure 10 illustrates the function Read_Icon_Files_To_RAM which is presented in Appendix B at lines 255-290. Starting at 456 in Figure 10 (line 255 in Appendix B), the function first determines at 458 (line 259 in Appendix B) whether any mimetypes are defined in the structure SG_TYPETABLE. If there are none, no icons are defined, an error message is returned at 460 (line 260 in Appendix B), the return code is set to "fail" at 462 (line 261 in Appendix B) and the return code is returned at 464 (lines 261-262 in Appendix B). If the structure SG_TYPETABLE is not empty, the function loads the default icon into RAM and sets a pointer to it at 466 (line 265 in Appendix B). Icon pointer numbers are related to LINGO castNumbers at line 268 in Appendix B and a counter for incrementing the castNumbers is set at line 270. The first (next) entry in the structure SG_TYPETABLE is read at 468 (line 271 in Appendix B). If it is determined at 470 (line 272 in Appendix B) that there are no more entries to read, the return code is set to "success" at 472 and the return code is returned at 464 (line 288 in Appendix B). So long as entries remain, the mimetype is read at 474 and the iconfilename is for the mimetype is read at 476 (line 273 in Appendix B). If it is determined at 478 (line 274 in Appendix B) that there is no icon associated with this mimetype, the default icon pointer is assigned to it at 480 (line 275 in Appendix B). Otherwise, the next icon bitmap and pointer are read at 482 (line 277 in Appendix B) using the function read_iconfile (lines 295-298 in Appendix B). If the icon pointer is not nil as determined at 484 (line 278 in Appendix B), the castNum is incremented at line 279. Otherwise the castNum is not incremented and the default icon pointer is used at 480 (line 280 in Appendix B). In either case, the icon pointer associated with the mimetype is inserted at 486 (line 283 in Appendix B). The counter is incremented at line 284 and the next entry from SG_TYPETABLE is read at 468 (line 285 in Appendix B).

Figure 11 illustrates the function install_type which is used to install a new icon and/or message handler for a particular mimetype or filetype. The function starts at 600 with input which includes an icon file name, a message handler program name, and either a mimetype or a filetype (lines 71-75 in Appendix B). This input can be provided by the user or by an automatic means as described below. The typetable file is read into RAM at 602 (line 78 in Appendix B) thereby creating SG_TYPETABLE. If SG_TYPETABLE is empty as determined at 604 (line 80 in Appendix B), an error is returned at 606 (lines 81-82 in Appendix B). Otherwise, the mimetype (or filetype) specified at 600 is retrieved at 608 (line 87 in Appendix B) from SG_TYPETABLE if it exists. If the mimetype (or filetype) exists in SG_TYPETABLE and if it is already associated with an icon and message handler, the user is prompted at 612 (line 90 in Appendix B) whether it should be redefined. If the user chooses NO, an error is returned at 614 (line 94 in Appendix B). If the mimetype was not previously defined or if the user chooses to redefine it, the message handler program specified at 600 is checked for validity (e.g. whether it is present on the hard disk or network) at 616 (line 102 in Appendix B). If it is not valid, an error is returned at 614 (lines 104-105 in Appendix B). If the message handler and the mimetype (filetype) are valid, they are associated with each other in SG_TYPETABLE at 618 (line 108 in Appendix B). Next, the icon file name specified at 600 is checked for validity at 620 (line 110 in Appendix B). If it is not valid, the default icon is specified at 622 (line 112 in Appendix B) and an error alert is returned at 624 (line 111 in Appendix B). In either case, the icon file name specified or the default icon, if necessary, is associated with the message handler and the mimetype (filetype) in SG_TYPETABLE at 626 (line 114 in Appendix B). The typetable.txt file is written back from SG_TYPETABLE at 628 (lines 122-125 in Appendix B) and unless an error is encountered, a success is returned at 630 (line 126 in Appendix B).

Those skilled in the art will appreciate that the install_type function can be called by another program so that icons are automatically installed/removed when modular authoring/reading components are installed/removed. Though not specifically shown in code or drawings herein, those skilled in the art will appreciate how to implement this second embodiment by referring to Appendix B herein and the component installing code of the parent application.

According to a third embodiment, new icons are added automatically whenever a new message type is encountered by the mailbox displayer. The new icon is retrieved from either the operating system registry or from the icon image data embedded in the message. Those skilled in the art will appreciate the implementation of this embodiment by reference to Appendix B herein and the above referenced MIME standards.

According to a fourth embodiment, the type updater automatically queries a network server for new icon information and downloads icon image data as needed or as scheduled. Those skilled in the art will appreciate that automatic updaters which download data from a file server are well known and that this embodiment may be implemented by reference to the known automatic updaters together with Appendix B herein.

There have been described and illustrated herein several embodiments of an enhanced electronic mail system including methods and apparatus for identifying mime types and for displaying different icons. While particular embodiments of the invention have been described, it is not intended that the invention be limited thereto, as it is intended that the invention be as broad in scope as the art will allow and that the specification be read likewise. Thus, while particular code listings have been disclosed, it will be appreciated that other code could be utilized. For example, although the Appendices illustrate the invention with MACROMEDIA DIRECTOR LINGO code, the invention could be embodied with C++, based on a "MOZILLA" engine, or via a number of other popular development tools. Also, while the invention has been disclosed with reference to the applicant's parent application which involves an email client having installable authoring/reading components, it will be recognized that the principles disclosed herein for displaying icons representing mimetypes in a mailbox listing may be applied to other kinds of email clients. Moreover, while particular configurations have been disclosed in reference to the way icon images are stored (i.e. scalable images), it will be appreciated that other configurations could be used as well. Further, while the invention has been shown with reference to display on a computer screen, it will be appreciated that the display may be on a television, a personal digital assistant, a cell phone, a wrist watch, etc. It will therefore be appreciated by those skilled in the art that yet other modifications could be made to the provided invention without deviating from its spirit and scope as so claimed.

Appendix A - Mailbox Displayer Code - Page 1

```
1   — MBOX_DISPLAYER IMPLEMENTATION
2   —— Code for a mailbox handler for the KidCode electronic mail client.
3   —— This Director MIAW displays a mailbox in a window as a list
4   — of messages with one line for each message. Each message has the following fields displayed:
5   — 1. message number
6   — 2. Message sender
7   — 3. Message mimetype & status (single icon used to indicate both properties)
8   — 4. Message subject header
9   — 5. Message date
10
11
12  on startMovie
13          global SG_lastActiveWindow — super global that keeps track of KC last active window
14          global mbxG_username — current user name
15          global mbxG_messages — list of messages
16          global mbxG_nMsgs — number of messages in mailbox
17          global mbxG_boxName — current mailbox name
18          global mbxG_whichLine — current hilite line = msgNumber
19          global mbxG_subtractLine
20          global mbxG_lips
21
22          set mbxG_lips = 0
23
24          — called by API to Main Movie
25          tell the stage to emh_continue(#mailbox)
26  end
27
28
29  on activateWindow
30          global SG_lastActiveWindow
31          global mbxG_myWindow
32          set SG_lastActiveWindow = mbxG_myWindow
33  end activateWindow
34
35
36  — Stop movie handlers
37  ------------------------------------------------------------------------
38  StopMovie handler in a MIAW is called only when the movie
39  — plays through to the end or jumps to another movie.
40  — It isn't called when the window is closed or the window
41  — is deleted by the forget window command.
42
43  on stopMovie
44          cleanUpMovie()
45  end
46  ------------------------------------------------------------------------
47  called to close a MIAW or automatically whenever
48  — forgetWindow is called
49
50  on closeWindow
51          cleanUpMovie()
```

Appendix A - Mailbox Displayer Code - Page 2

```
52  end
53  ---------------------------------------------------------------------
54
55  -- cleanUpMovie can be called by both stopMovie and
56  -- closeWindow.
57
58  on cleanUpMovie
59          global mbxG_whichLine
60          global mbxG_subtractLine
61          global mbxG_nMsgs
62          global mbxG_username
63          global mbxG_lips
64
65          -- CLEAR FIELDS AND GLOBAL VARIABLES
66
67          put "" into field "MailboxTitle"
68          put "" into field "prepositionTitle"
69          put "" into field "MessageNumber"
70          put "" into field "MailboxTo"
71          put "" into field "MailboxSubject"
72          put "" into field "MailboxDate"
73          put "" into field "Messageread"
74
75          set mbxG_nMsgs = 0
76          set mbxG_lips = 0
77          resetHilite()
78
79          if findEmpty(member 50) > 50 then
80                  set the scriptText of member 50 = ""
81          end if
82
83          set the memberNum of sprite 6 = the memberNum of member "lips up"
84          set the loc of sprite 4 to point(800, 4)
85          set the loc of sprite 5 = point(800, 19)
86  end cleanUpMovie
87
88
89  -- API Public Handlers ---------------------------------------------------
90  --
91  -- Ugly hack to work around problem with Director startup
92  -- of MIAWs. The problem is that, after calling a handler in the
93  -- MIAW, the StartMovie handler for the MIAW does not run until
94  -- the calling movie advances to its next frame.
95  -- Therefore, the calling sequence in the calling movie
96  -- has to be engineered so that the real handlers in the MIAW do not
97  -- run until after control has been transfered back to the calling
98  -- movie. However, at least one handler in the MIAW must be called
99  -- by the calling movie before the StartMovie handler will run.
100
101 -- startMeUp is the fake handler that, when called by the
102 -- main movie, will upon return to the main movie,
```

Appendix A - Mailbox Displayer Code - Page 3

```
103   — cause this movie's startMovie handler to run.
104
105   — The second part of this wormy hack is contained in the MIAW's
106   — startMovie handler... It is a call to a workAround handler in
107   — the calling movie called continueComponent
108   — The calling movie's continueRebus handler calls the real handlers
109   — in the MIAW.
110
111   on emc_startMeUp
112         — put "Macromedia sucks!"
113         return(TRUE)
114   end emc_startMeUp
115
116   ------------------------------------------------------------------------
117   initWindow is called by email main when a message handler
118   — is opened
119
120   on emc_initWindow userName, windowName
121         global mbxG_myWindow
122         global mbxG_username
123         global mbxG_platformType
124
125   — put "ENTER emc_initWindow mailbox"
126         set mbxG_username = userName
127         set mbxG_myWindow = windowName
128
129         — puppet the hilite (MB 4-17-99) removed this
130         resetHilite()
131         tell the stage to emh_getColorDepth()
132         set colorDepth = the result
133         mapColors(colorDepth)
134         tell the stage to emh_getPlatformType()
135         set mbxG_platformType = the result
136
137   — put "EXIT emc_initWindow mailbox"
138
139         return(TRUE)
140
141   end emc_initWindow
142
143   ------------------------------------------------------------------------
144   — closeWindow is not called unless Rebus plays as
145   — a MIAW.
146
147   on emc_closeWindow
148   — put "ENTER emc_closeWindow Mailbox"
149         closeWindow()
150         — step frame
151   — put "EXIT emc_closeWindow Mailbox"
152         return(TRUE)
153
```

Appendix A - Mailbox Displayer Code - Page 4

```
154  end emc_closeWindow
155
156  ------------------------------------------------------------------------
157
158  on emc_getComponentInfo
159          return( list( "SimpleMail", 1, #mailbox, "text" ) )
160  end emc_getComponentInfo
161
162  ------------------------------------------------------------------------
163
164  on mbx_getMessage
165  --
166  -- -- "open" button and doubleClick of highlighted message
167  -- -- calls to email main to hand the message
168  -- -- selected to a message handling movie
169  -- -- This script was previously the "open" cast memeber script:
170  --
171  -- global mbxG_whichLine
172  -- global mbxG_messages
173  --
174  -- set mailData = getAt(mbxG_messages, mbxG_whichLine)
175  --
176  -- return(mailData)
177  --
178  --
179  --
180  --end mbx_getMessage
181
182  ------------------------------------------------------------------------
183
184  on mbx_getMessageNumber
185          global mbxG_whichLine
186          return(mbxG_whichLine)
187  end mbx_getMessageNumber
188
189  ------------------------------------------------------------------------
190  -- mbx_trashMessages returns a list of messages that are to
191  -- be trashed in the mailfile. Email main will rewrite the mail file
192  -- When implemented correctly, it will determine which message numbers
193  -- are associated with the currently selected lines in the mailbox
194  -- display, update the display to remove these messages from the
195  -- list, and return the list of deleted message numbers.
196
197  on mbx_trashMessages
198
199          global mbxG_messages -- list of messages
200          global mbxG_nMsgs -- number of messages in mailbox
201          global mbxG_whichLine -- current hilite line = msgNumber
202
203          -- set mailData = getAt(mbxG_messages, mbxG_whichLine)
204          --
```

Appendix A - Mailbox Displayer Code - Page 5

```
205         — — tell the stage
206         — return(mailData)
207         — — end tell
208
209         — needs implementation that can handle multiple messages
210         — also need to rewrite trashIt which does not conform to
211         — API rule that only API handlers can be called in other movies
212         —
213         — set message = mbxG_messages
214         if mbxG_whichLine > 0 AND mbxG_whichLine <= mbxG_nMsgs then
215             tell the stage to emh_alertUserToTrash()
216             set yes = the result
217             if not yes then return [] -- user canceled
218
219             set trashList = list(getAt(mbxG_messages, mbxG_whichLine))
220             deleteAt(mbxG_messages, mbxG_whichLine)
221             set mbxG_nMsgs = mbxG_nMsgs - 1
222             displayMailbox(mbxG_messages)
223             resetHilite()
224         else
225             alert("Please click on the message you wish to delete.")
226             set trashList = []
227         end if
228
229         return(trashlist)
230
231 end mbx_trashMessages
232
233 ---------------------------------------------------------------------
234 — accepts a mailbox datastructure that consists of a boxname and
235 — a list of messages
236
237 on mbx_openMailbox mailbox
238         global mbxG_username
239         global mbxG_messages
240         global mbxG_boxName
241         global mbxG_nMsgs
242
243 — put "ENTER mbx_openMailbox"
244         set mbxG_boxName = getAt(mailbox, 1)
245         put mbxG_userName & "'s " & mbxG_boxName into field "mailboxTitle"
246
247         set mbxG_messages = getAt(mailbox, 2)
248         set mbxG_nMsgs = count(mbxG_messages)
249
250         displayMailbox(mbxG_messages)
251
252 — put "EXIT mbx_openMailbox"
253         return(TRUE)
254
255 end mbx_openMailbox
```

Appendix A - Mailbox Displayer Code - Page 6

```
256
257 ---------------------------------------------------------------------
258
259 Utilities –
260 ---------------------------------------------------------------------
261 Initialize formatting of text fields
262 — Thanks to Frank Leahy for this one
263
264 on SetTextInfo fldName, fldValue, fldAlign, fldFont, fldSize, fldStyle
265         if fldValue <> EMPTY then
266                 put fldValue into field fldName
267         end if
268         set the textAlign of field fldName = fldAlign
269         set the textFont of field fldName = fldFont
270         set the textSize of field fldName = fldSize
271         set the textStyle of field fldName = fldStyle
272 end
273
274 ---------------------------------------------------------------------
275 on formatFields
276
277         — FORMAT THE TEXT FIELDS
278
279         setTextInfo "MessageNumber", " ", "left", "arial", 14, "bold"
280         setTextInfo "MailboxTo", " ", "left", "arial", 14, "bold"
281         setTextInfo "MailboxSubject", " ", "left", "arial", 14, "bold"
282         setTextInfo "MailboxDate", " ", "left", "arial", 14, "bold"
283         setTextInfo "Messageread", " ", "left", "arial", 14, "bold"
284
285 end formatFields
286
287 — MAIN MAILBOX DISPLAY FUNCTION
288 — displays a Mailbox style listing of messages
289 — places the appropriate components from each message
290 — into field members with lines aligned for display
291
292 on displayMailBox msgList
293         global SG_TYPETABLE — super global variable shared across different MIAWS
294         global mbxG_red
295         global mbxG_platformType
296         global mbxG_iconList
297
298         — mbxG_iconList for future use in up/down scroll scripts
299         set mbxG_iconList = [:]
300         set count = 0
301
302         — first clear all the fields and the sprites
303         put "" into field "MessageNumber"
304         put "" into field "MailboxTo"
305         put "" into field "mailboxSubject"
306         put "" into field "mailboxDate"
```

Appendix A - Mailbox Displayer Code - Page 7

```
307         put "" into field "Messageread"
308
309         repeat with i = 40 to 70
310                 set the member of sprite i = member "blank"
311         end repeat
312
313         -- Fill the text fields with info from all of the messages so that it is available
314         -- when the window scrolls
315         repeat with msg in msgList
316
317         ---- with the exception of mailbox, mimetype and status,
318         ---- the fields will automatically be displayed when filled
319
320         put the lineCount of member "MailboxTo"+1 & RETURN after field "MessageNumber"
321         put getProp(msg, #from) & RETURN after field "MailboxTo"
322         put getProp(msg, #subject) & RETURN after field "mailboxSubject"
323         put getProp(msg, #date) & RETURN after field "mailboxDate"
324         put getProp(msg, #mailbox) into mailbox
325         put getProp(msg, #mimetype) into mime
326         put getProp(msg, #status) into status
327
328         ---- Display the mimetype icon
329         ---- We use the mimetype icon to also indicate message status. A greyscale version of the
330         -- icon is displayed if a message has been read. Otherwise a color icon is displayed.
331
332         ---- Icons will be placed in sprite channel 40 and beyond
333                 set i = 40 + count
334                 set count = count + 1
335
336         -- find the icon for the message mimetype
337         ---- this code should be rewritten using a data access function. For now we need to
338         ---- know the format of the TYPETABLE data structure
339
340                 set mimeProperties = getProp(SG_TYPETABLE, mime)
341                 set iconCastMember = getAt(mimeProperties, 2) -- second item is the cast member
342                 number
343
344         -- if this type is unknown then use the default icon
345                 if iconCastMember = 0 then set iconCastMember = the number of member
346                 "DefaultIcon"
347
348         -- get the greyscale version of the icon if the message has been read.
349                 if status = "R" then set iconCastMember = iconCastMember + 1
350
351         -- add the icon to the list of icons used for scrolling the window
352                 append (mbx_iconList, iconCastMember)
353
354         -- place the icon at the proper location for display
355                 set the memberNum of sprite i to iconCastMember
356
357         -- display the icon in the correct grid cell in the mailbox message list.
```

Appendix A - Mailbox Displayer Code - Page 8

```
358         — set the locH of all icons to 50
359         set whereGoesIcon = the lineCount of member "MailboxTo"
360         puppetSprite i, TRUE
361         set the visible of sprite i = TRUE
362         set the locH of sprite i to 50
363
364         — precise placement of the icon next to it's message...
365         set positonVar = 105 + linePosToLocV(member "MailboxTo", whereGoesIcon)
366         set the locV of sprite i to positonVar
367         — but don't let icons fall go beyond window if there are many messages
368         if positonVar > 550 or positonVar < 105 then
369             set the visible of sprite i = FALSE
370         else
371             set the visible of sprite i = TRUE
372         end if
373         addProp mbxG_iconList, (the locV of sprite i), mime
374         end repeat
375
376 end displayMailbox
377
378 — FUNCTIONS USED TO RESPOND TO USER INTERACTION WITH MAILBOX
379 — HILITE MESSAGE is called when a user clicks a mouse on a message line
380
381 on hiliteMessage whichLine
382     global mbxG_nMsgs, mbxG_whichLine, mbxG_subtractLine, mbxG_messages
383
384 — KEEP TRACK OF SELECTED LINE
385
386 set mbxG_whichLine = whichLine
387
388 — MAKE SURE LINE IS VALID
389
390 if mbxG_whichLine <= 0 then
391     return(0) — do nothing, errors are caught elsewhere
392 else if mbxG_whichLine > mbxG_nMsgs then
393     — user clicked somewhere else in field
394     set mbxG_whichLine = 0 — reset to 0
395     return(0)
396 end if
397
398 — HIGHLIGHT SELECTED LINE
399
400 set whichHighlight = mbxG_whichLine + mbxG_subtractLine
401
402 — since all field members in display are kept synchronized
403 — any one will do for linePosToLocV
404 — use "MailboxTo", it's small
405
406 set the locV of Sprite 11 to ¬
407     (99 + linePosToLocV(member "MailboxTo", whichHighlight))
408
```

Appendix A - Mailbox Displayer Code - Page 9

```
—when the user double clicks on a hilited message, go get it from mailFile

if the doubleClick then
        set maildata = getAt(mbxG_messages, mbxG_whichLine)
        tell the stage
                emh_openMessage(maildata)
        end tell
        — mbx_getMessage()
end if

end hiliteMessage


-----------------------------------------------------------------------

on resetHilite
        global mbxG_whichLine, mbx_subtractLine

        set mbxG_whichLine = 0
        set mbxG_subtractLine = 0

        — SET HIGHLIGHT OFF STAGE
        set the loc of sprite 11 to point (11, -20)

end resetHilite
-----------------------------------------------------------------------
— this is a lookup table for color
— only really necessary for Mac platform
— use on any color that you want to
— set the forecolor of field

on mapColors colorDepth
        global mbxG_red
        global mbxG_blue
        global mbxG_white
        global mbxG_black

        case colorDepth of

                8:
                        set mbxG_red = 6
                        set mbxG_blue = 4
                        set mbxG_white = 0
                16:
                        set mbxG_red = 31744
                        set mbxG_blue = 31
                        set mbxG_white = 32767
                32:
                        set mbxG_red = 16711680
                        set mbxG_blue = 255
                        set mbxG_white = 16777215
```

Appendix A - Mailbox Displayer Code - Page 10

```
460         end case
461
462         set mbxG_black = the forecolor of line 1 of member the member of sprite 4
463
464 end mapColors
465
466 ---------------------------------------------------------------------------
467 scripts run when the mouse is clicked on a mailbox message line.
468 A script is needed for each field in the message line.
469
470 on mouseUp
471         hiliteMessage (the clickon - 40)
472 end
473
474
475 on mouseDown
476
477         global mbxG_lips
478         set whichLine = the mouseLine
479         if mbxG_lips then
480                 set astr = line whichline of field "MailboxTo"
481                 speak(astr)
482         else
483                 hiliteMessage(whichLine)
484         end if
485 end
486
487 on mouseDown
488
489         global mbxG_lips
490         set whichLine = the mouseLine
491         if mbxG_lips then
492                 set astr = line whichline of field "MailboxSubject"
493                 speak(astr)
494         else
495                 hiliteMessage(whichLine)
496         end if
497 end
498
499 ---------------------------------------------------------------------------
500 more scripts run when the mouse is clicked on a mailbox message line
501
502 on mouseDown
503         global mbxG_lips
504         set whichLine = the mouseLine
505         if mbxG_lips then
506
507                 set astr = line whichline of field "MailboxDate"
508                 set aday = word 1 of astr
509                 case aday of
510                         "Mon,": put "Monday" into word 1 of astr
```

Appendix A - Mailbox Displayer Code - Page 11

```
                        "Tue,": put "Tuesday" into word 1 of astr
                        "Wed,": put "Wednesday" into word 1 of astr
                        "Thu,": put "Thursday" into word 1 of astr
                        "Fri,": put "Friday" into word 1 of astr
                        "Sat,": put "Saturday" into word 1 of astr
                        "Sun,": put "Sunday" into word 1 of astr
                        otherwise
                end case

                speak(astr)
        else
                hiliteMessage(whichLine)
        end if
end

on mouseDown
        global mbxG_lips

        set whichLine = the mouseLine
        if mbxG_lips then
                set astr = line whichline of field "MessageNumber"
                speak(astr)
        else
                hiliteMessage(whichLine)
        end if
end


-- this script is attached to the message type icon which is displayed in the message line

on mouseUp
        set whichLine = the mouseLine
        hiliteMessage(mouseLine)
end

---- code for scroll buttons

on mouseDown
        global mbxG_whichLine
        global mbxG_subtractLine
        global mbxG_iconList

        -- SCROLL UP WITH HIGHLIGHT
        -- ICONS NOW SCROLL... HOWEVER, ICON SPRITE POSITION IS BASED ON
        -- MBXG_SUBTRACTLINE, NOT ON THE THE ACTUAL CORRESPONDING LINE
        NUMBER
        -- OF THE MESSAGE IN THE MAILBOX WINDOW.

        set numberOfIconsVar = count(mbxG_iconList)
        set lastIconPos = getPropAt(mbxG_iconList, count(mbxG_iconList))
        if lastIconPos >= 550 then
```

Appendix A - Mailbox Displayer Code - Page 12

```
562             — there are enough messages to make scrolling nessisary
563             repeat while the mouseDown = TRUE
564
565             —oldSubtractLine gets set to mbxG_subtractLine before mbxG_sub. gets
566             —incremented. This keeps the icons from falling one position behind
567             —it's prospective message
568
569             set oldSubtractLine = mbxG_subtractLine
570             set mbxG_subtractLine = mbxG_subtractLine + 1
571
572             if mbxG_subtractLine > 0 then
573                     set mbxG_subtractLine = 0
574             end if
575
576         — SCROLL ALL FIELDS TOGETHER
577
578         scrollByLine member "MessageNumber", -1
579         scrollByLine member "MailboxTo", -1
580         scrollByLine member "MailboxSubject", -1
581         scrollByLine member "MailboxDate", -1
582         scrollByLine member "mime", -1
583         scrollByLine member "Messageread", -1
584
585         set numberOfIcons = the lineCount of member "MailboxTo" + 40
586         set amountOfMail = the lineCount of member "MailboxTo"
587
588         — for debugging
589         — put "linecount:" & the lineCount of member "MailboxTo"
590         — put "subtractline:" & mbxG_subtractLine
591
592         repeat with i = 40 to numberOfIcons
593
594
595             — if the following 2 conditions are true, then scroll the icons
596             — i.e. if messages scroll, icons do too, if not, then neither do icons.
597
598             if mbxG_subtractLine >= - amountOfMail + 1 and oldSubtractLine < 0 then
599                     set the locV of sprite i = the locV of sprite i + 15
600                     if the locV of sprite i < 105 then
601                             set the visible of sprite i = FALSE
602                     else
603                             set the visible of sprite i = TRUE
604                     end if
605             else
606                     nothing
607             end if
608         end repeat
609
610         — MOVE HIGHLIGHT WITH LINE, MOVING HIGHLIGHT
611         — OFF SCREEN WHEN LINE MOVES OFF SCREEN
612         set whichHighlight = mbxG_whichLine + mbxG_subtractLine
```

Appendix A - Mailbox Displayer Code - Page 13

```
613         if whichHighlight <= 0 or whichHighlight >= 22 then
614         set the loc of sprite 11 to point (11, -20)
615         else -- set the locV of highlight to scrolled message
616         set the locV of Sprite 11 to (99 + linePosToLocV(member "MailboxTo", whichHighlight))
617         end if
618         updateStage
619         end repeat
620         end if
621   end
622
623   on mouseUp
624         set numberOfIcons = the lineCount of member "MailboxTo" + 40
625         repeat with i = 40 to numberOfIcons
626               if the locV of sprite i > 550 or the locV of sprite i < 105 then
627                     set the visible of sprite i = FALSE
628               else
629                     set the visible of sprite i = TRUE
630               end if
631         end repeat
632   end
633
634   on mouseDown
635         global mbxG_whichLine
636         global mbxG_subtractLine
637         global mbxG_iconList
638
639
640         -- AS MESSAGES ARE SCROLLED, ICONS NEED TO MOVE WITH THE
641         MESSAGE, AND
642         THE MEMBERNUM
643         -- OF ICON SPRITES BE ASSIGNED TO THE NEW MESSAGE THAT IS VISIBLE
644         AFTER
645         -- BEING SCROLLED.
646         -- ICONS NOW SCROLL... HOWEVER, ICON SPRITE POSITION IS BASED ON
647         -- MBXG_SUBTRACTLINE, NOT ON THE THE ACTUAL CORRESPONDING LINE
648         NUMBER
649         -- OF THE MESSAGE IN THE MAILBOX WINDOW.
650         set numberOfIconsVar = count(mbxG_iconList)
651         set lastIconPos = getPropAt(mbxG_iconList, count(mbxG_iconList))
652         if lastIconPos >= 550 then
653               -- there are enough messages to make scrolling nessisary
654               repeat while the mouseDown = TRUE
655                     scrollByLine member "MessageNumber", 1
656                     scrollByLine member "MailboxTo", 1
657                     scrollByLine member "MailboxSubject", 1
658                     scrollByLine member "MailboxDate", 1
659                     scrollByLine member "mime", 1
660                     scrollByLine member "Messageread", 1
661                     -- GET NUMBER USED TO CORRECT FOR DISCREPANCY
662                     BETWEEN
663                     -- THE MOUSELINE AND THE LINEPOSTOLOCV
```

Appendix A - Mailbox Displayer Code - Page 14

```
                        — THE MOUSELINE GIVES LINE WITHIN FIELD TOTAL
                        — THE LINEPOSTOLOCV USES LINE OF FIELD ON SCREEN
                        set mbxG_subtractLine = mbxG_subtractLine - 1
                        set numberOfIcons = the lineCount of member "MailboxTo" + 40
                        set amountOfMail = the lineCount of member "MailboxTo"
                        — put "linecount:" & the lineCount of member "MailboxTo"
                        — put "subtractline:" & mbxG_subtractLine
                        repeat with i = 40 to numberOfIcons
                                if mbxG_subtractLine >= - amountOfMail + 1 then
                                        set the locV of sprite i = the locV of sprite i - 15
                                        if the locV of sprite i <105 then
                                                set the visible of sprite i = FALSE
                                        else
                                                set the visible of sprite i = TRUE
                                        end if
                                else
                                        nothing
                                end if
                        end repeat

                        if mbxG_subtractLine < - amountOfMail + 1 then
                                set mbxG_subtractLine = - amountOfMail + 1
                        end if

                        — MOVE HIGHLIGHT WITH LINE, MOVING HIGHLIGHT
                        — OFF SCREEN WHEN LINE MOVES OFF SCREEN

                        set whichHighlight = mbxG_whichLine + mbxG_subtractLine
                        if whichHighlight <= 0 or whichHighlight >= 22 then
                                set the loc of sprite 11 to point (11, -20)
                        else
                                set the locV of Sprite 11 to (99 + linePosToLocV(member
                                "MailboxTo", whichHighlight))
                        end if
                        updateStage
                end repeat
        end if
end

——

on emc_indicateCheckingInternet
        global mbxG_red
        global mbxG_blue
        global mbxG_white
        global mbxG_black

        if the locH of sprite 4 > 600 then
                set the loc of sprite 4 = point(223, 4)
        end if
        — if the locH of sprite 5 > 600 then
        —       set the loc of sprite 5 = point(509, 19)
        — end if
```

Appendix A - Mailbox Displayer Code - Page 15

```
717
718         set colorNow = the forecolor of line 1 of member the member of sprite 4
719
720         case colorNow of
721                 mbxG_black: set colorNext = mbxG_blue — blue
722                 mbxG_blue: set colorNext = mbxG_white — pink
723                 mbxG_white: set colorNext = mbxG_red — red
724                 mbxG_red: set colorNext = mbxG_blue — blue
725         end case
726
727         set the forecolor of line 1 of member the member of sprite 4 to colorNext
728         updateStage
729
730 end emc_indicateCheckingInternet
731
732 on emc_endIndicateCheckingInternet
733         set the loc of sprite 4 to point(800, 4)
734         set the loc of sprite 5 = point(800, 19)
735         cursor -1
736         updateStage
737 end emc_endIndicateCheckingInternet
738
739 ——— Scripts for the close window button
740
741 on mouseDown
742
743         repeat while the stillDown
744                 if inside(point(the mouseH, the mouseV), the rect of sprite the clickon) then
745                         if the name of member the member of sprite the clickon = "closeWindow"
746                         then
747                                 set the member of sprite the clickon = "closeWindow_down"
748                                 updateStage
749                         end if
750                 else
751                         set the member of sprite the clickon = "closeWindow"
752                         updateStage
753                 end if
754         end repeat
755         set the member of sprite the clickon = "closeWindow"
756         updateStage
757
758 end mouseDown
759
760 on mouseUp
761
762         — Close the window
763         if inside(point(the mouseH, the mouseV), the rect of sprite the clickon) then
764                 — these next to lines are to try and speed up
765                 — the disposal of the mailbox icons on close
766                 — need to check this on slower machine.
767                 hideMailIcons(the lineCount of member "MailboxTo")
```

Appendix A - Mailbox Displayer Code - Page 16

```
                go frame "stop"
                tell the stage to emh_killComponent(0, "")
                set success = the result
                if success <> TRUE then
                        alert("error closing mailbox MIAW")
                end if
        end if
end

on hideMailIcons numberOfIcons
        repeat with i = 40 to (40 + numberOfIcons)
                set the visible of sprite i = FALSE
        end repeat
        updateStage
end


-- script for the open button

on mouseDown

        repeat while the stillDown
                if inside(point(the mouseH, the mouseV), the rect of sprite the clickon) then
                        if the name of member the member of sprite the clickon = "open" then
                                set the member of sprite the clickon = "open_down"
                                updateStage
                        end if
                else
                        set the member of sprite the clickon = "open"
                        updateStage
                end if
        end repeat
        set the member of sprite the clickon = "open"
        updateStage
end mouseDown
```

Appendix A - Mailbox Displayer Code - Page 17

```
805   on mouseUp
806
807         if inside(point(the mouseH, the mouseV), the rect of sprite the clickon) then
808               global mbxG_whichLine, mbxG_messages
809               if mbxG_whichLine = 0 then
810                     alert "Select a message by clicking with your mouse."
811                     exit
812               end if
813               set maildata = getAt(mbxG_messages, mbxG_whichLine)
814               tell the stage
815                     emh_openMessage(maildata)
816               end tell
817         end if
818   end
```

Appendix B - Type Updater Code - Page 1

```
--- TYPE_UPDATER IMPLEMENTATION
---- Code for a component that maintains message type information for the
---- KidCode electronic mail client.
---- This Director MIAW makes public functions available for calling by other components
of KidCode

--- public functions
--- 1. Initialize_TypeTable
---- 2. Install_Type
---- 3. Uninstall_Type



----- private functions ñfor internal use only
----- 1. Write_Typetable_File
----- 2. Read_Typetable_File
---  3. Read_Icon_Files_To_RAM
----  4. read_iconFile
----  5. delete_mimetype
----  6. insert_mimetype
----  7. delete_filetype
----  8. insert_filetype


--- Filename for permanent storage version of TYPETABLE file
--- typetable.txt     --default directory is the currentPath directory


--- INITIALIZE_TYPETABLE initializes the data structures used to lookup Mime type
icons,  attachment filetype icons and message handler MIAWs.
--- The SG_Typetable is set up prior to itís use.  File attachment information is not looked
up until it is used when a message with an attached file is encountered.

on Initialize_TypeTable
global SG_TYPETABLE        --- super global variable shared across different MIAWS for
Typetable
global SG_ATTACH_TYPETABLE    ---- maintains info for attachment filetypes

set SG_TYPETABLE = [:]    -- initialize property list for mimetype information

-- initialize property list for filetype information
-- this list will be filled only as messages with attachments are encountered
set SG_ATTACH_TYPETABLE = [:]
set SG_TYPETABLE = Read_TypeTable_File(the pathname & " typetable.txt")

if count(SG_TYPETABLE) = 0 then    -- failed to read typetable file
  alert ("Error: Failed to read the file of MIMEtypes")
  return (0)
end if

set retVal = Read_Icon_Files_To_RAM()
```

Appendix B - Type Updater Code - Page 2

```
52
53      if retVal = 0 then
54        alert("Error: Failed to load MIME type icons.)
55        return (0)
56      else
57        return(1)
58      end if
59
60      end   --- Initialize_TypeTable
61
62
63
64      --- INSTALL_TYPE is used to install a new MIME type into the system.
65      INSTALL_TYPE takes as input a mimetype (string), a filename of the message handling
66      movie, an filename of the bitmap that contains the mimetype icon and, optionally, a file
67      extension (string). The function adds the information associated with the MIME type
68      (given by the function parameters) into the MIME type table recorded in permanent storage.
69      Here we use the file "typetable.txt" for permanent storage of the MIME type info.
70
71      on Install_Type mimeToInstall, msgHandler_filename, icon_filename, filetype
72      global SG_TYPETABLE        --- information on all installed MIME types
73
74      set DEFAULT_ICONFILE = "defaultIcon.bmp"
75      set SG_TYPETABLE = [:]    -- initialize property list for mimetype information
76
77      ---read the existing MIME type information into RAM
78      set SG_TYPETABLE = Read_TypeTable_File(the pathname & " typetable.txt")
79
80      if count(SG_TYPETABLE) = 0 then    -- failed to read typetable file
81        alert ("Error: Failed to read the file of MIMEtypes")
82        return (0)
83      end if
84
85      ---Check to see if mimetype is already installed
86
87      set mimeProperties = get_mimetype(mimeToInstall)
88
89      if mimeProperties <> 0 then   ---mimetype is already installed
90        set redefineAlert = baMsgBox(theMessage, "KidCode", "YesNoCancel", "Question", 1)
91
92        -- the alert function should not save the message, only do the alert
93        case redefineAlert of
94            "No":  return 0
95            "Cancel": return ñ1
96            otherwise:    nothing  -- continue
97        end case
98      end if
99
100     --- Define the new mimetype
101
102     if verifyMessageHandler(msgHandler_filename) = 0 then --something wrong with
```

Appendix B - Type Updater Code - Page 3

```
103       program file
104         alert("Error: invalid message handler program" && msgHandler_filename)
105         return(0)
106       end if
107
108       insert_msgHandler(SG_TYPETABLE, mimeToInstall, msgHandler_filename)
109
110       if verifyIconImage(icon_filename) = 0 then   --something wrong with icon file
111         alert("Error: invalid icon file" && msgHandler_filename ". Using default icon.")
112         insert_iconFileName(SG_TYPETABLE, mimeToInstall, DEFAULT_ICONFILE)
113       else
114         insert_iconFileName(SG_TYPETABLE, mimeToInstall, icon_filename)
115       end if
116
117       if filetype <>"" then
118         insert_fileytype(mimeToInstall, filetype)
119         writeTypeToRegistry(mimeToInstall, filetype)
120       end if
121
122       set retVal = write_TypeTable_File()
123       if retVal = 0 then
124       alert("Error writing typetable to file." && mimeToInstall && "not installed.")
125       return(0)
126       else return(1)
127
128       end   --- Install_Type
129
130
131       ----- UNINSTALL_TYPE removes a mimetype and itís properties from both the file and
132       the global variable SG_TYPETABLE
133
134       on unInstall_Type  mimeType
135       global SG_TYPETABLE        --- information on all installed MIME types
136
137       set SG_TYPETABLE  = [:]    -- initialize property list for mimetype information
138
139       ---read the existing MIME type information into RAM
140       set SG_TYPETABLE  = Read_TypeTable_File(the pathname & " typetable.txt")
141
142       if  count(SG_TYPETABLE) = 0 then    -- failed to read typetable file
143         alert ("Error: Failed to read the file of MIMEtypes")
144         return (0)
145       end if
146
147       delete_mimetype(mimeType)
148
149       --- write the revised typetable to the file
150       set retVal = write_TypeTable_File()
151       if retVal = 0 then
152       alert("Error." && mimeToInstall && "could not be uninstalled. Typetable file write
153       error.")
```

Appendix B - Type Updater Code - Page 4

```
154     return(0)
155     else return(1)
156
157     end unInstall_Type
158
159     --- WRITE_TYPETABLE_FILE writes the information in SG_TYPETABLE to the
160     typetable file on disk. This file stores properties associated with each mimetype.
161     ---- SG_TYPETABLE is a property list that contains a list of mimetypes.
162
163     on Write_Typetable_File
164     global SG_TYPETABLE        --- super global variable shared across different MIAWS
165     set fileName = the pathname & "typetable.txt"
166     set bkupFileName = the pathname & "typetable.bak"
167
168     if count( SG_TYPETABLE) = 0 then     -- no mimetypes defined
169             alert("Error. No mimetype data to write.)
170     return(0)
171     end if
172
173     --- create backup for typetable file
174     copyFile(filename, bkFileName)
175
176     -- start up Fileio Xtra
177      set mFile = new(xtra "fileio")
178
179      set retVal = deleteFile(mFile, filename)   -- delete old version before rewriting
180      set retVal = createFile(mFile, filename)
181      if retVal = 0 then
182              alert("Error updating typetable file.")
183              renameFile(bkFileName, filename)
184              return(0)
185      end if
186
187      openFile(mFile, fileName, 2)  -- open for write access
188      setPosition(mFile, 0)
189
190     --- write the data into the file
191     set i= 1
192     set mimeType = getAt(SG_TYPETABLE, i)
193     repeat while mimeType <> 0
194             set dataToWrite = mimetype
195             put " " & get_filetype(mimetype) into dataToWrite
196             put " " & get_iconFileName(mimetype) into dataToWrite
197     put " " & get_MsgHandler(mimetype) into dataToWrite
198     writeline(mFile, dataToWrite)
199     set i= i+1
200     set mimeType = getAt(SG_TYPETABLE, i)
201     end repeat
202
203     closeFile(mFile)
204     set retVal = deleteFile(mFile, bkFileName)   -- delete backup file
```

Appendix B - Type Updater Code - Page 5

```
205     return(0)
206     end  Write_TypeTable_File
207     --- READ_TYPETABLE_FILE reads the typetable file
208     ---- and creates a data structure in memory, SG_TYPETABLE
209     ---- SG_TYPETABLE is a property list that contains a list of mimetypes
210
211     When the function returns, the global property list data structure, SG_TYPETABLE,
212     contains an entry for each mimetype. Along with the pathName for the message handling
213     movie and the IconFile. Later the cast member number for the icon in RAM will be added
214     to the datastructure. For now these are all set to 0. This data structure looks like,
215     [ "text/plain": ["txt",  0, "C:\KidCode\text.gif", "C:\KidCode\text.dxr"], "x-
216     application/grid": ["",  0, "C:\KidCode\grid.gif", "C:\KidCode\grid.dxr"]]
217
218     on Read_TypeTable_File
219     global SG_TYPETABLE        --- super global variable shared across different MIAWS
220     set fileName = the pathname & "typetable.txt"
221
222     set SG_TYPETABLE  = [:]    -- initialize property list for mimetypes
223
224     -- start up Fileio Xtra
225      set mFile = new(xtra "fileio")
226      openFile(mFile, fileName, 1)  -- open for read only access
227      set status = status(mFile)
228
229      if status <> 0 then
230        alert("Error. Could not open mimetype table: " & error(mFile, status))
231        closeFile(mFile)  -- just to be safe
232        return FALSE
233      end if
234
235      setPosition(mFile, 0)
236
237      -- Lingo canít read one line at a time so simulate this by reading the entire file into the
238    string, str
239      set str = readFile(mFile)
240
241      set nTypes = the number of lines in str
242       repeat with j = 1 to nTypes
243            set mimetype = word 1 of line j
244            insert_mimetype(mimetype)
245            insert_filetype(mimetype, word 2 of line j)
246            insert_iconFileName(mimetype, word 3 of line j)
247            insert_msgHandler(mimetype, word 4 of line j)
248        end repeat
249
250      closeFile(mFile)
251
252    end   Read_TypeTable_File
253
254
255    on Read_Icon_Files_To_RAM
```

Appendix B - Type Updater Code - Page 6

```
256     global SG_TYPETABLE
257     global SG_DEFAULT_ICON_PTR = 1000
258
259     if count( SG_TYPETABLE) = 0 then     -- no mimetypes defined
260             alert("Error. No mimetype data. Canít load icons.)
261     return(0)
262     end if
263
264     ---load the default icon
265     importFileInto(member SG_DEFAULT_ICON_PTR, the pathname & "defaulticon.gif")
266
267     --- cycle through the mimetypes loading icons
268     set castNum = SG_DEFAULT_ICON_PTR + 1   --first icon immediately follows the
269     default
270     set i= 1
271     set mimeType = getAt(SG_TYPETABLE, i)
272     repeat while mimeType <> 0
273             set iconFile = get_iconFileName(SG_TYPETABLE, mimetype)
274             if icon ="" then  --- icon not defined use default
275                     set iconPtr = SG_DEFAULT_ICON_PTR
276             else
277     set iconPtr = read_IconFile(iconFile, castNum )
278     if iconPtr  > 0 then
279             set castNum = castNum + 1
280     else set iconPtr = SG_DEFAULT_ICON_PTR
281             end if
282
283             insert_iconPtr(mimetype, iconPtr)
284     set i= i+1
285     set mimeType = getAt(SG_TYPETABLE, i)
286     end repeat
287
288     return(1)
289
290     end Read_Icon_Files_To_RAM
291
292
293
294     --- READ_ICONFILE loads a single icon bitmap into RAM
295     on read_IconFile filename, castMemberNum
296     set retVal = importFileInto(member castNum, iconFile)
297     return (retVal)
298     end read_IconFile
299     --- Data Access Functions for MIMETYPE info
300     --- Data is stored in the property list SG_TYPETABLE with the following structure:
301     --- mimetype: properties
302     --- where mimetype is a string, e.g. "text/plain"
303     --- and properties is a list with the following elements:
304     ----     [ filetype, iconPtr, iconFilename, msgHandler_FileName
305     ---- e.g. SG_TYPETABLE =
306     ----     [ "text/plain": ["txt",  0, "C:\KidCode\text.gif", "C:\KidCode\text.dxr"],
```

Appendix B - Type Updater Code - Page 7

```
307       ----        "x-application/grid": ["", 0, "C:\KidCode\grid.gif", "C:\KidCode\grid.dxr"]]
308
309       on get_mimetype mimetype
310       global SG_TYPETABLE
311       return( getProp(SG_TYPETABLE, mimetype) )
312       end
313
314       on get_filetype mimetype
315       global SG_TYPETABLE
316       set theProperties = getProp(SG_TYPETABLE, mimetype)
317       return( getAt(theProperties, 1) )
318       end
319
320       on get_iconPtr mimetype
321       global SG_TYPETABLE
322       set theProperties = getProp(SG_TYPETABLE, mimetype)
323       return( getAt(theProperties, 2) )
324       end
325
326       on get_iconFileName mimetype
327       global SG_TYPETABLE
328       set theProperties = getProp(SG_TYPETABLE, mimetype)
329       return( getAt(theProperties, 3) )
330       end
331
332       on get_msgHandler mimetype
333       global SG_TYPETABLE
334       set theProperties = getProp(SG_TYPETABLE, mimetype)
335       return( getAt(theProperties, 4) )
336       end
337
338       on insert_mimetype mimetype
339       global SG_TYPETABLE
340       addProp(SG_TYPETABLE, mimetype)
341       end
342
343       on insert_filetype mimetype, filetype
344       global SG_TYPETABLE
345       set theProperties = getProp(SG_TYPETABLE, mimetype)
346             add(theProperties, filetype)
347             setProp(SG_TYPETABLE, mimetype, theProperties)
348       end
349
350       on insert_iconPtr mimetype, iconPtr
351       global SG_TYPETABLE
352       set theProperties = getProp(SG_TYPETABLE, mimetype)
353             add(theProperties, iconPtr)
354             setProp(SG_TYPETABLE, mimetype, theProperties)
355       end
356
357       on insert_iconFileName mimetype, iconFilename
```

Appendix B - Type Updater Code - Page 8

```
358     global SG_TYPETABLE
359     set theProperties = getProp(SG_TYPETABLE, mimetype)
360             add(theProperties, iconFilename)
361             setProp(SG_TYPETABLE, mimetype, theProperties)
362     end
363
364     on insert_msgHandler mimetype
365     global SG_TYPETABLE
366     set theProperties = getProp(SG_TYPETABLE, mimetype)
367             add(theProperties, msgHandler)
368             setProp(SG_TYPETABLE, mimetype, theProperties)
369     end
370
371
372     on delete_mimetype mimetype
373     global SG_TYPETABLE
374     deleteProp(SG_TYPETABLE, mimetype)
375     end
376
377     on delete_filetype mimetype
378     global SG_TYPETABLE
379     set properties = getProp(SG_TYPETABLE, mimetype)
380             setAt(properties, 1,"")
381             setProp(SG_TYPETABLE, mimetype, properties)
382     end
383
384     on delete_icon mimetype
385     global SG_TYPETABLE
386     set properties = getProp(SG_TYPETABLE, mimetype)
387             setAt(properties, 2, 0)
388             setProp(SG_TYPETABLE, mimetype, properties)
389     end
390
391     on delete_iconFileName mimetype
392     global SG_TYPETABLE
393     set properties = getProp(SG_TYPETABLE, mimetype)
394             setAt(properties, 3,"")
395             setProp(SG_TYPETABLE, mimetype, properties)
396     end
397
398     on delete_msgHandler mimetype
399     global SG_TYPETABLE
400     set properties = getProp(SG_TYPETABLE, mimetype)
401             setAt(properties, 4,"")
402             setProp(SG_TYPETABLE, mimetype, properties)
403     end
```

Claims:

1. Electronic mail client software for use with a display device, comprising:

a) mailbox displayer means for displaying the contents of a mailbox as a scrollable list on the display device wherein each item of mail is listed with a plurality of properties, said properties selected from the group consisting of subject, sender's name, and date sent;

b) association means for associating a plurality of mime types with a plurality of icon images, wherein

said mailbox displayer means includes means for determining the mime type of at least some items of mail in the mailbox, means for reading said association means, and means for displaying in the scrollable list an icon image as a property associated with each of said at least some items of mail, said icon image for each of said at least some items of mail being selected from said association means according to the mime type for each of said at least some items of mail.

2. Electronic mail client software according to claim 1, further comprising:

c) type updater means for updating said association means to include additional mime types and additional icon images.

3. Electronic mail client software according to claim 1, further comprising:

c) a plurality of icon images, each having a filename, wherein

said association means is a data structure associating each of at least some mime types with the filenames of an icon image.

4. Electronic mail client software according to claim 1, wherein:

said association means includes means for associating mime types with programs, and

wherein some mimetypes are not associated with icon images but are associated with programs.

5. Electronic mail client software according to claim 2, wherein:

said type updater means is responsive to user input.

6. Electronic mail client software according to claim 3, wherein:

at least some of said plurality of images are scalable.

7. Electronic mail client software according to claim 1, wherein:

said electronic mail client software is designed to be used with an operating system which maintains a registry of icons, and

said association means associates at least some mime types with icons selected from said registry of icons.

8. Electronic mail client software according to claim 1, further comprising:

c) icon recovery means for reading graphical icon information contained in an email or email attachment, wherein

said association means associates a mime type with an icon recovered by said icon recovery means if no other icon is found.

9. Electronic mail client software according to claim 2, wherein:

said type updater means is manually operable by a user of said electronic mail client software.

10. Electronic mail client software according to claim 2, wherein:

said type updater means automatically installs a new icon image according to an event selected from the group consisting of

a new application or component is installed which is capable of authoring/reading a new mime type,

a new mime type is encountered in a received mail message, and

a regularly scheduled event causes said type updater to check a server for new icons.

11. A method of displaying a list of the contents of an electronic mail box on a display device, comprising:

a) displaying the contents of the mailbox as a scrollable list on the display device wherein each item of mail is listed with a plurality of properties, said properties selected from the group consisting of subject, sender's name, and date sent;

b) determining the mime type of at least some items of mail in the mailbox;

c) displaying in the scrollable list an icon image as a property associated with each of said at least some items of mail, said icon image for each of said at least some items of mail being selected according to the mime type for each of said at least some items of mail.

12. A method according to claim 11, further comprising:

d) associating mime types with programs;

e) executing a program associated with a mime type when a mail item of the mime type is opened.

13. A method according to claim 11, wherein:

at least some of said icon images are scalable.

14. A method according to claim 11, wherein:

said step of displaying includes selecting at least some icons from a central registry of icons.

15. A method according to claim 11, wherein:

said step of displaying includes reading graphical icon information contained in an email or email attachment.

16. A method according to claim 11, further comprising:

d) maintaining a store of graphical icons for use when performing said step of displaying.

17. A method according to claim 16, further comprising:

e) automatically installing a new icon image in said store of graphical icons in response to an event selected from the group consisting of

when a new application or component is installed which is capable of authoring/reading a new mime type,

when a new mime type is encountered in a received mail message, and

when a regularly scheduled event causes said type updater to check a server for new icons.

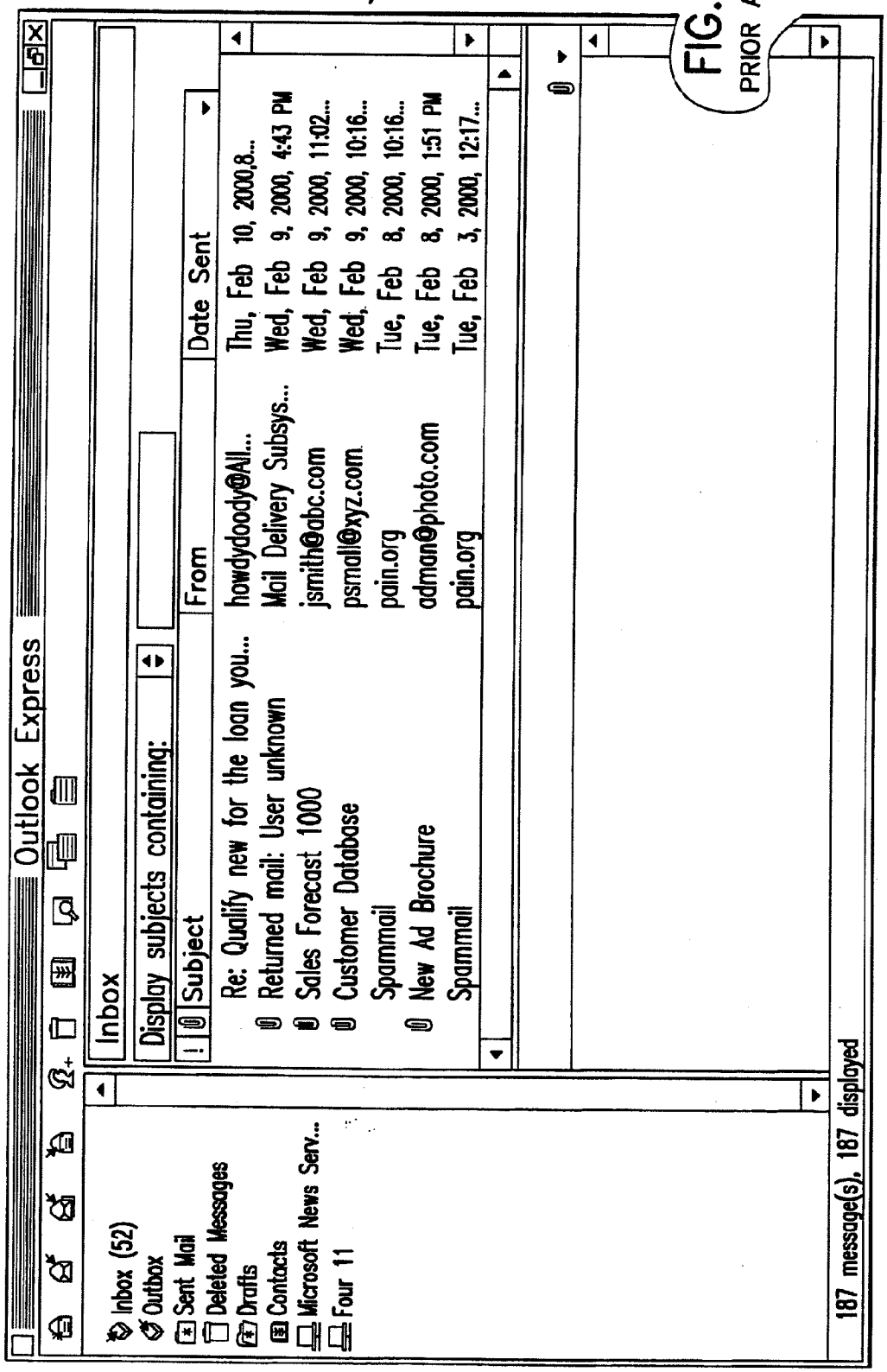

FIG. 1
PRIOR ART

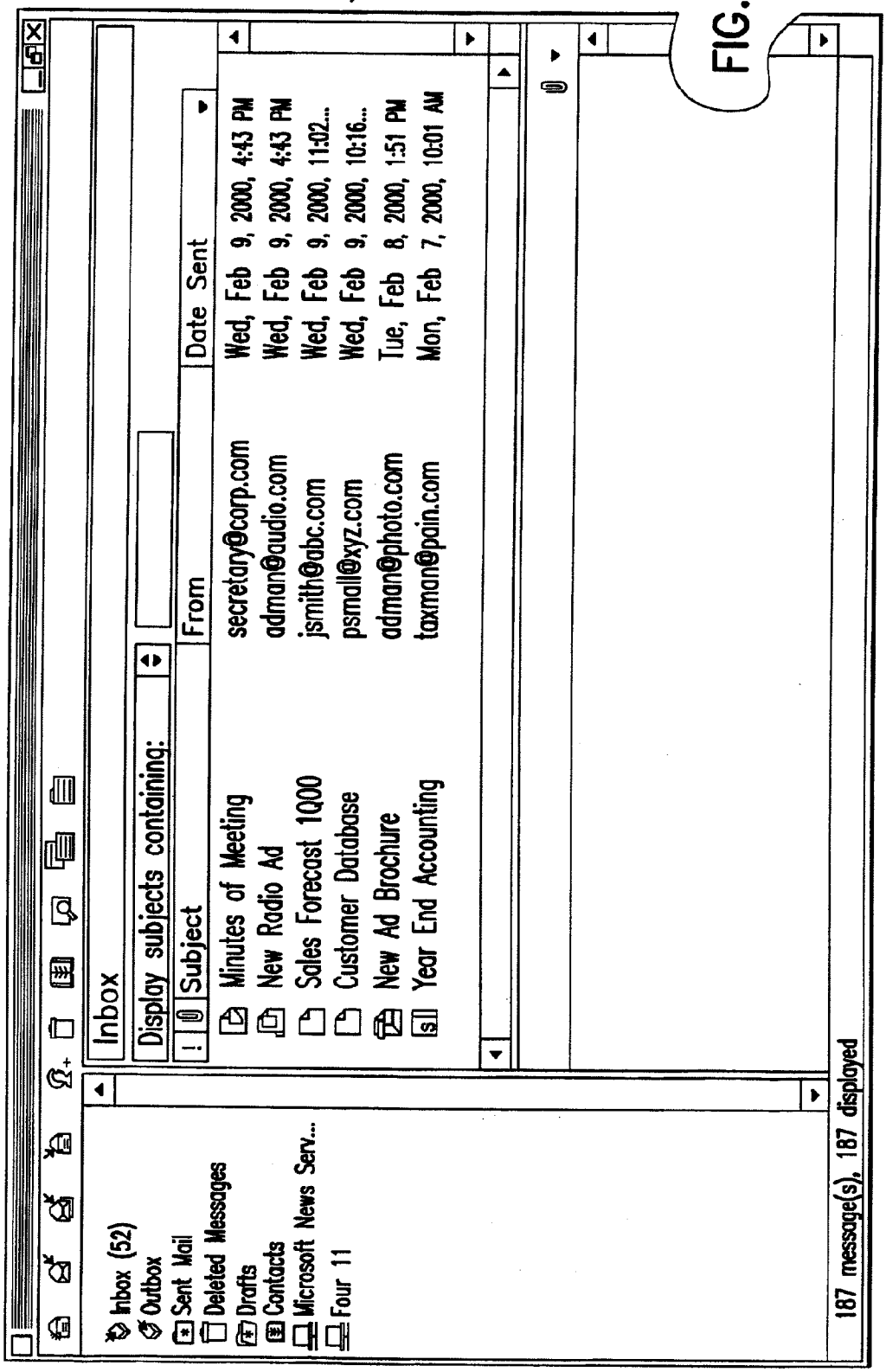
Inbox (52)
Outbox
Sent Mail
Deleted Messages
Drafts
Contacts
Microsoft News Serv...
Four 11
Inbox
Display subjects containing:
! | Subject | From | Date Sent
Minutes of Meeting | secretary@corp.com | Wed, Feb 9, 2000, 4:43 PM
New Radio Ad | adman@audio.com | Wed, Feb 9, 2000, 4:43 PM
Sales Forecast 1Q00 | jsmith@abc.com | Wed, Feb 9, 2000, 11:02...
Customer Database | psmall@xyz.com | Wed, Feb 9, 2000, 10:16...
New Ad Brochure | adman@photo.com | Tue, Feb 8, 2000, 1:51 PM
Year End Accounting | taxman@pain.com | Mon, Feb 7, 2000, 10:01 AM
187 message(s), 187 displayed

FIG.2

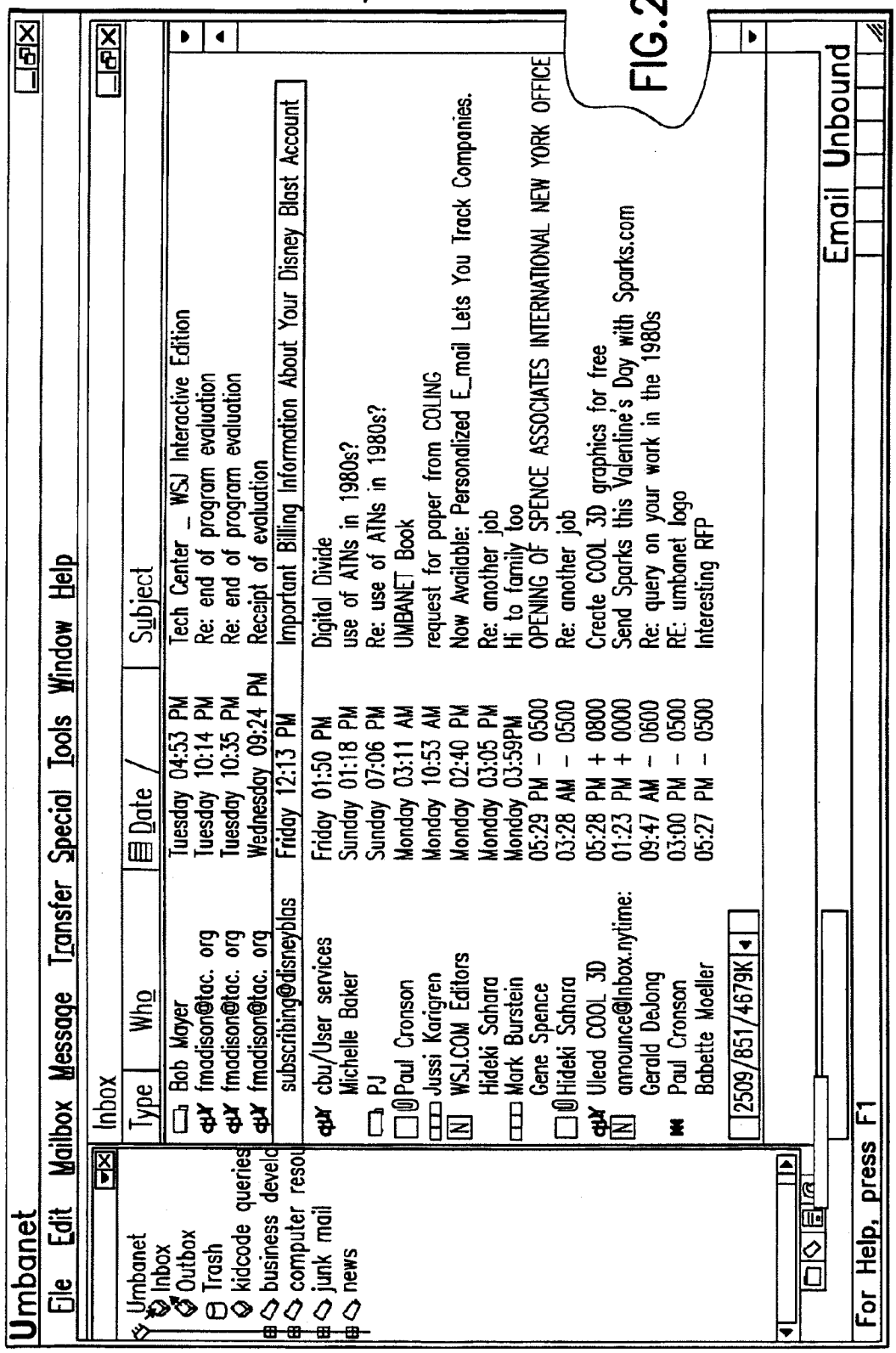
Umbanet
File Edit Mailbox Message Transfer Special Tools Window Help
Umbanet
Inbox
Outbox
Trash
kidcode queries
business develo
computer resou
junk mail
news
Inbox
Type | Who | Date | Subject
Bob Mayer Tuesday 04:53 PM Tech Center _ WSJ Interactive Edition
fmadison@tac. org Tuesday 10:14 PM Re: end of program evaluation
fmadison@tac. org Tuesday 10:35 PM Re: end of program evaluation
fmadison@tac. org Wednesday 09:24 PM Receipt of evaluation
subscribing@disneyblas Friday 12:13 PM Important Billing Information About Your Disney Blast Account
cbu/User services Friday 01:50 PM Digital Divide
Michelle Baker Sunday 01:18 PM use of ATNs in 1980s?
PJ Sunday 07:06 PM Re: use of ATNs in 1980s?
Paul Cronson Monday 03:11 AM UMBANET Book
Jussi Karigren Monday 10:53 AM request for paper from COLING
WSJ.COM Editors Monday 02:40 PM Now Available: Personalized E_mail Lets You Track Companies.
Hideki Sahara Monday 03:05 PM Re: another job
Mark Burstein Monday 03:59PM Hi to family too
Gene Spence 05:29 PM - 0500 OPENING OF SPENCE ASSOCIATES INTERNATIONAL NEW YORK OFFICE
Hideki Sahara 03:28 AM - 0500 Re: another job
Ulead COOL 3D 05:28 PM + 0800 Create COOL 3D graphics for free
announce@inbox.nytime: 01:23 PM + 0000 Send Sparks this Valentine's Day with Sparks.com
Gerald DeJong 09:47 AM - 0600 Re: query on your work in the 1980s
Paul Cronson 03:00 PM - 0500 RE: umbanet logo
Babette Moeller 05:27 PM - 0500 Interesting RFP
2509/851/4679K
For Help, press F1
Email Unbound

FIG.2a

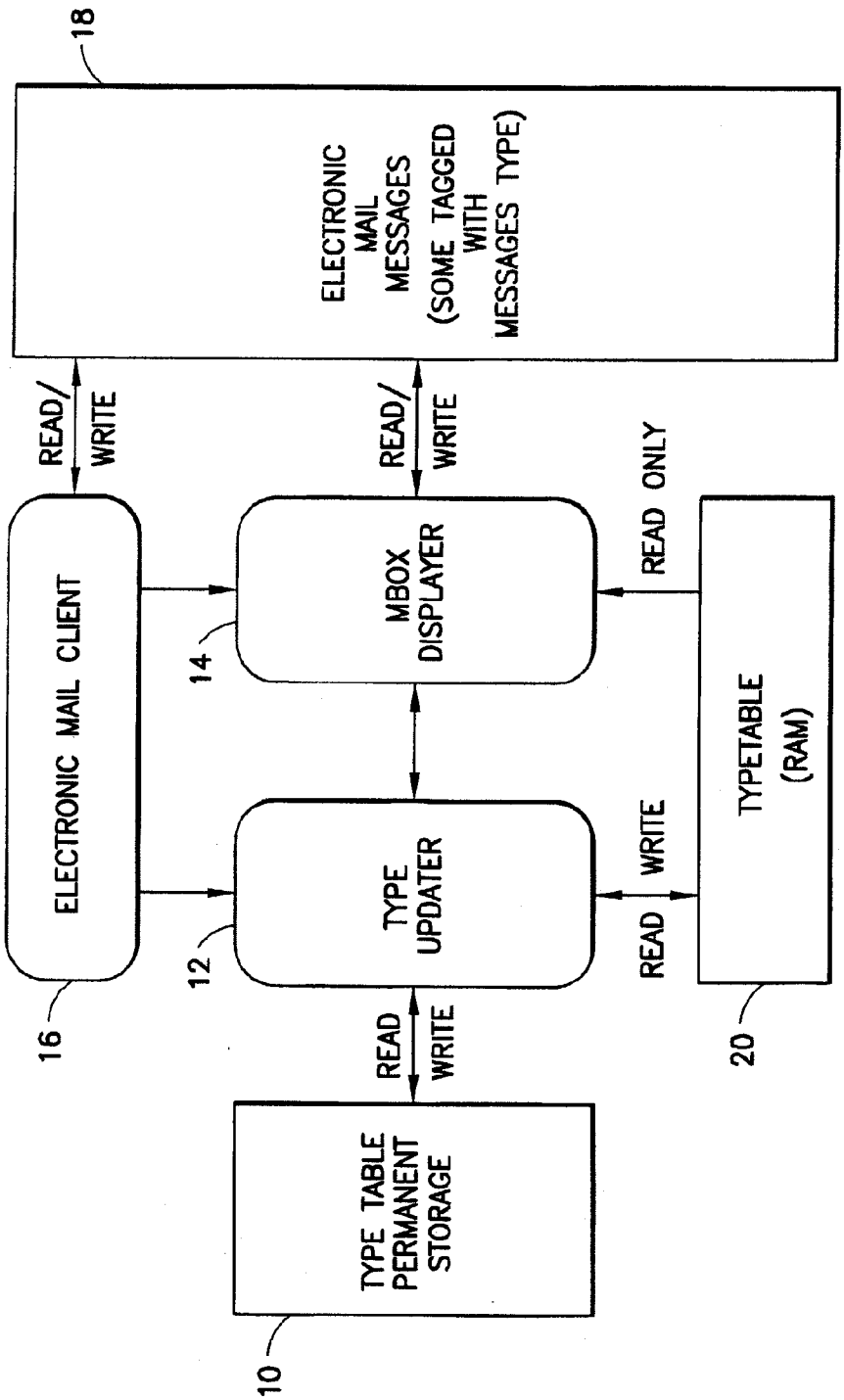
18
ELECTRONIC MAIL MESSAGES (SOME TAGGED WITH MESSAGES TYPE)
READ/ WRITE
READ/ WRITE
READ ONLY
ELECTRONIC MAIL CLIENT
MBOX DISPLAYER
14
TYPE UPDATER
12
WRITE
READ
TYPETABLE (RAM)
16
20
READ
WRITE
TYPE TABLE PERMANENT STORAGE
10

FIG.3

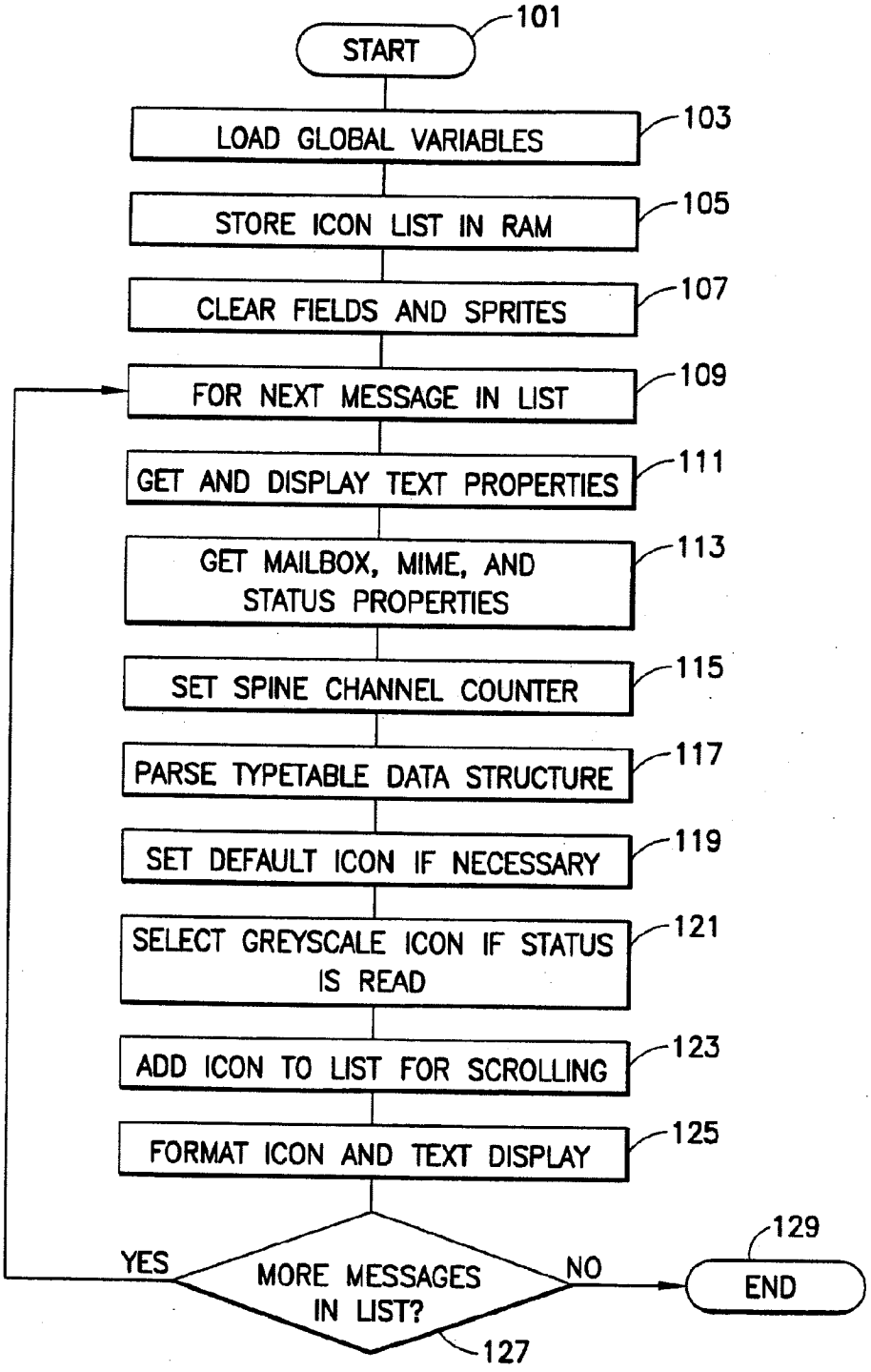
START
101
LOAD GLOBAL VARIABLES
103
STORE ICON LIST IN RAM
105
CLEAR FIELDS AND SPRITES
107
FOR NEXT MESSAGE IN LIST
109
GET AND DISPLAY TEXT PROPERTIES
111
GET MAILBOX, MIME, AND STATUS PROPERTIES
113
SET SPINE CHANNEL COUNTER
115
PARSE TYPETABLE DATA STRUCTURE
117
SET DEFAULT ICON IF NECESSARY
119
SELECT GREYSCALE ICON IF STATUS IS READ
121
ADD ICON TO LIST FOR SCROLLING
123
FORMAT ICON AND TEXT DISPLAY
125
MORE MESSAGES IN LIST?
127
YES
NO
END
129

FIG.4

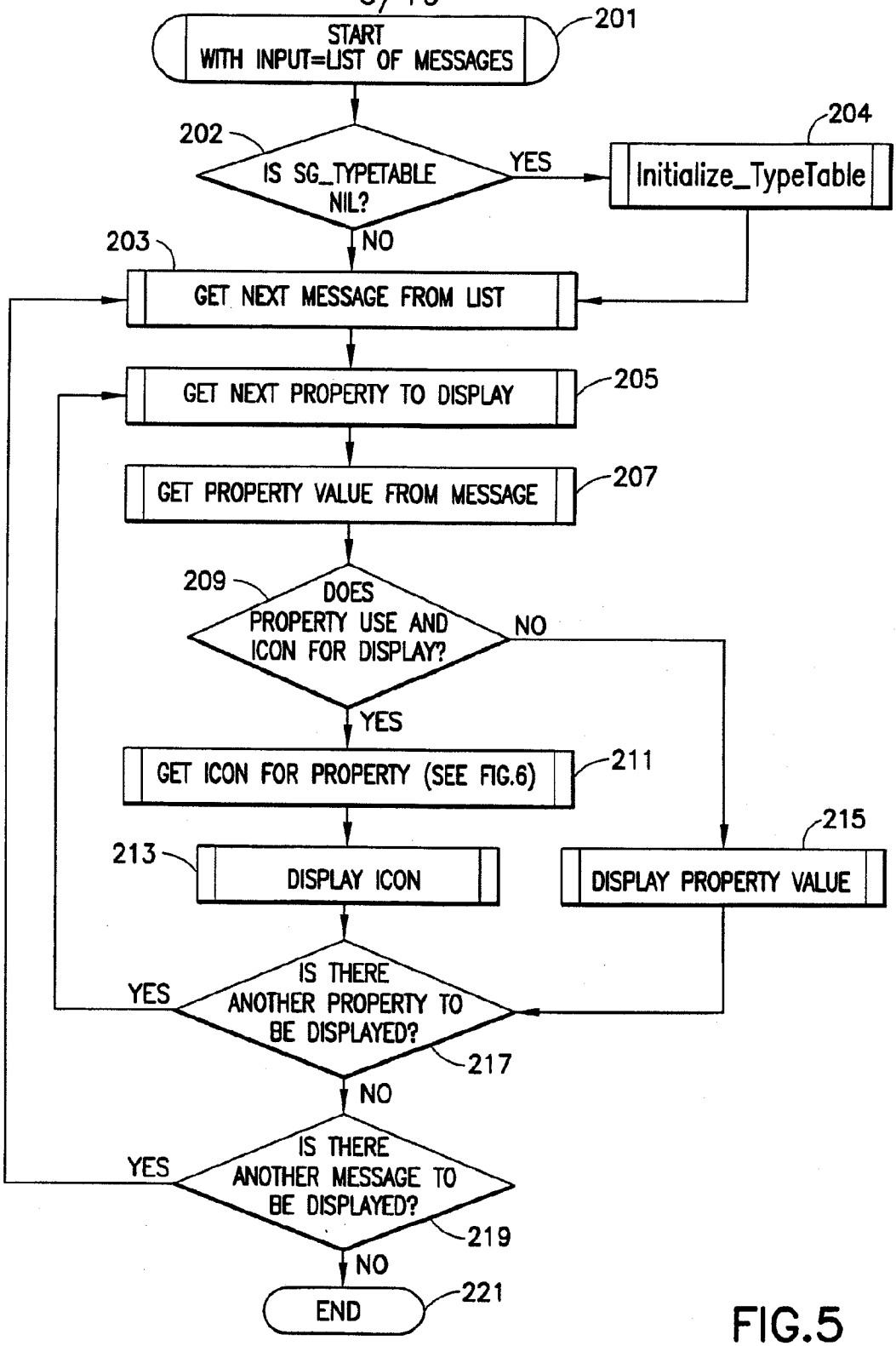
START WITH INPUT=LIST OF MESSAGES
201
IS SG_TYPETABLE NIL?
202
YES
Initialize_TypeTable
204
NO
GET NEXT MESSAGE FROM LIST
203
GET NEXT PROPERTY TO DISPLAY
205
GET PROPERTY VALUE FROM MESSAGE
207
DOES PROPERTY USE AND ICON FOR DISPLAY?
209
NO
YES
GET ICON FOR PROPERTY (SEE FIG.6)
211
DISPLAY ICON
213
DISPLAY PROPERTY VALUE
215
IS THERE ANOTHER PROPERTY TO BE DISPLAYED?
YES
217
NO
IS THERE ANOTHER MESSAGE TO BE DISPLAYED?
YES
219
NO
END
221

FIG.5

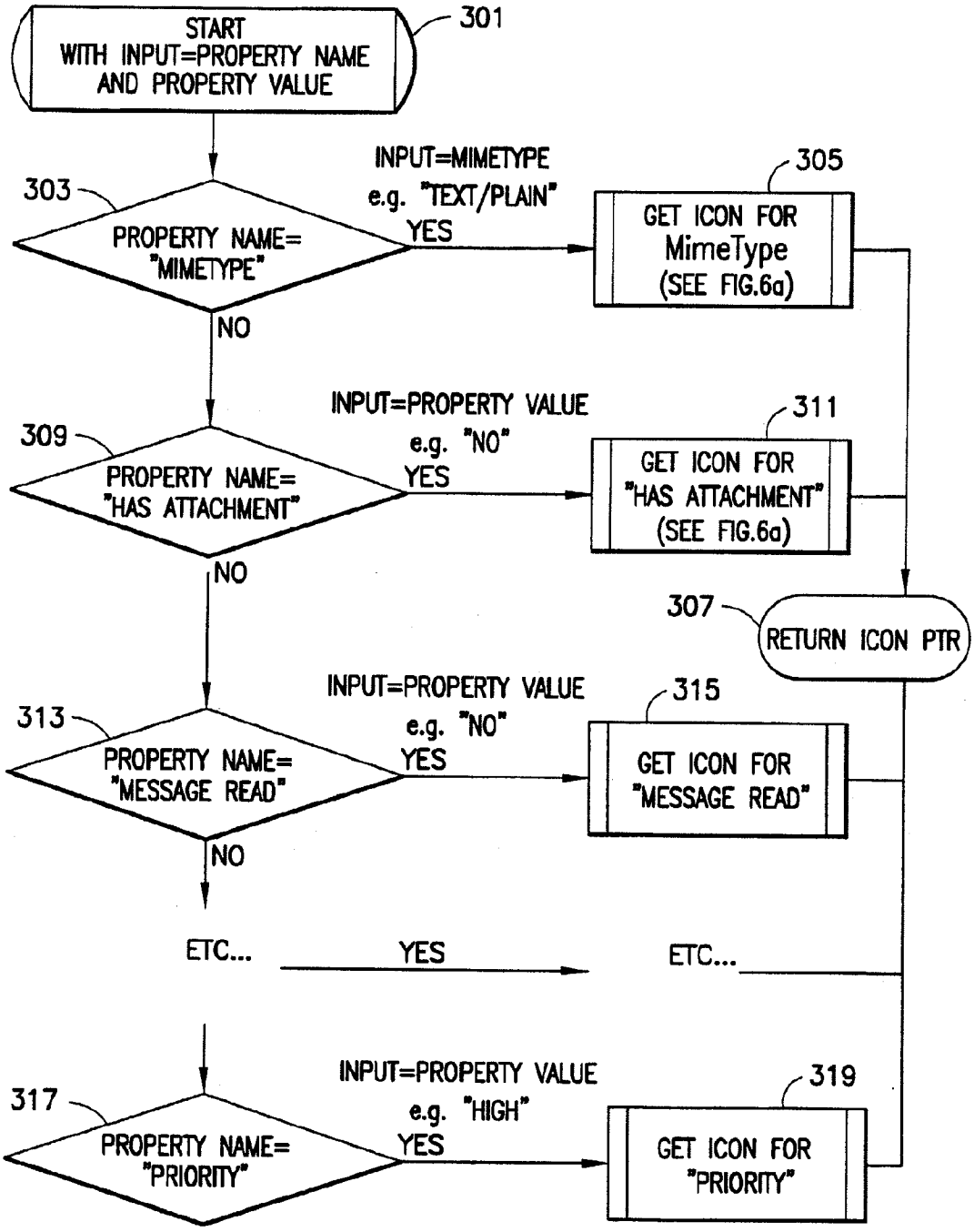
START
WITH INPUT=PROPERTY NAME
AND PROPERTY VALUE
301
303
PROPERTY NAME=
"MIMETYPE"
INPUT=MIMETYPE
e.g. "TEXT/PLAIN"
YES
305
GET ICON FOR
MimeType
(SEE FIG.6a)
NO
309
PROPERTY NAME=
"HAS ATTACHMENT"
INPUT=PROPERTY VALUE
e.g. "NO"
YES
311
GET ICON FOR
"HAS ATTACHMENT"
(SEE FIG.6a)
NO
307
RETURN ICON PTR
313
PROPERTY NAME=
"MESSAGE READ"
INPUT=PROPERTY VALUE
e.g. "NO"
YES
315
GET ICON FOR
"MESSAGE READ"
NO
ETC...
YES
ETC...
317
PROPERTY NAME=
"PRIORITY"
INPUT=PROPERTY VALUE
e.g. "HIGH"
YES
319
GET ICON FOR
"PRIORITY"

FIG.6

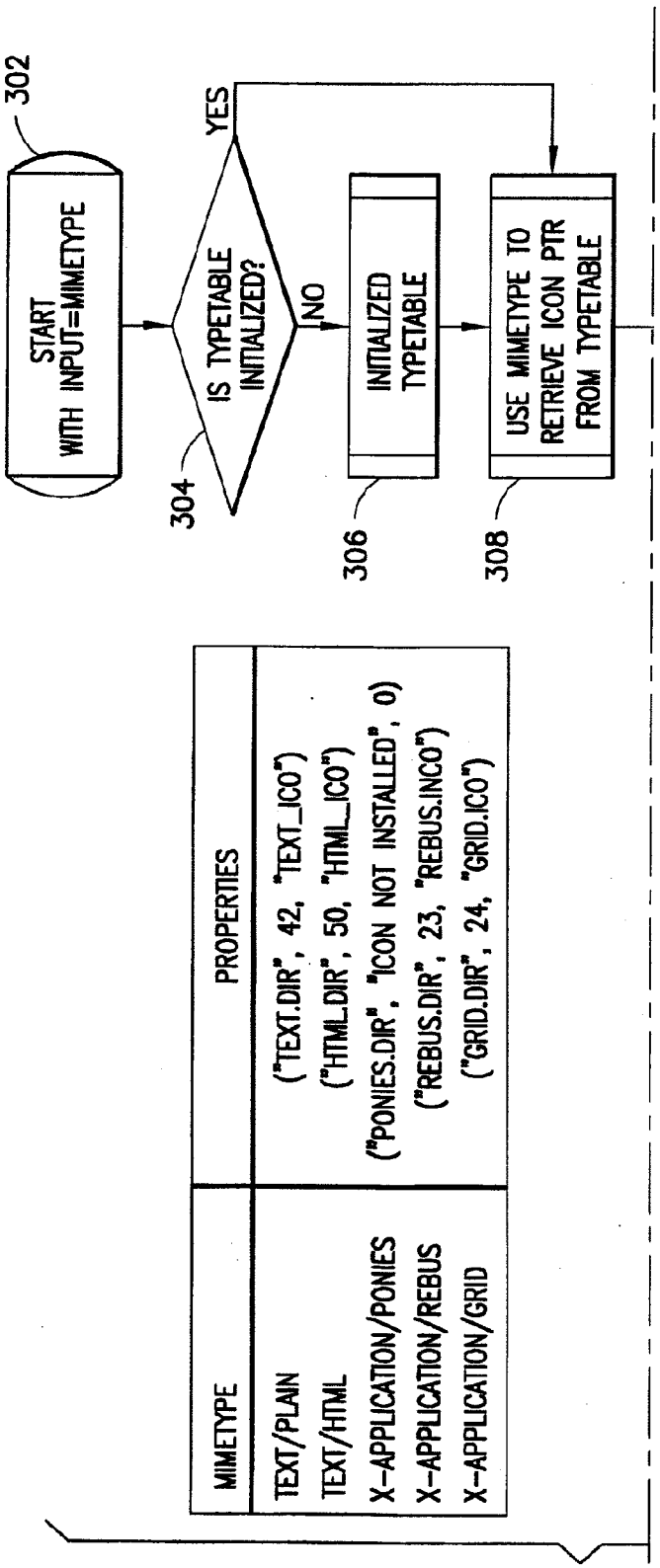

FIG.6a

FIG.6a-1

FIG.6a-1
FIG.6a-2

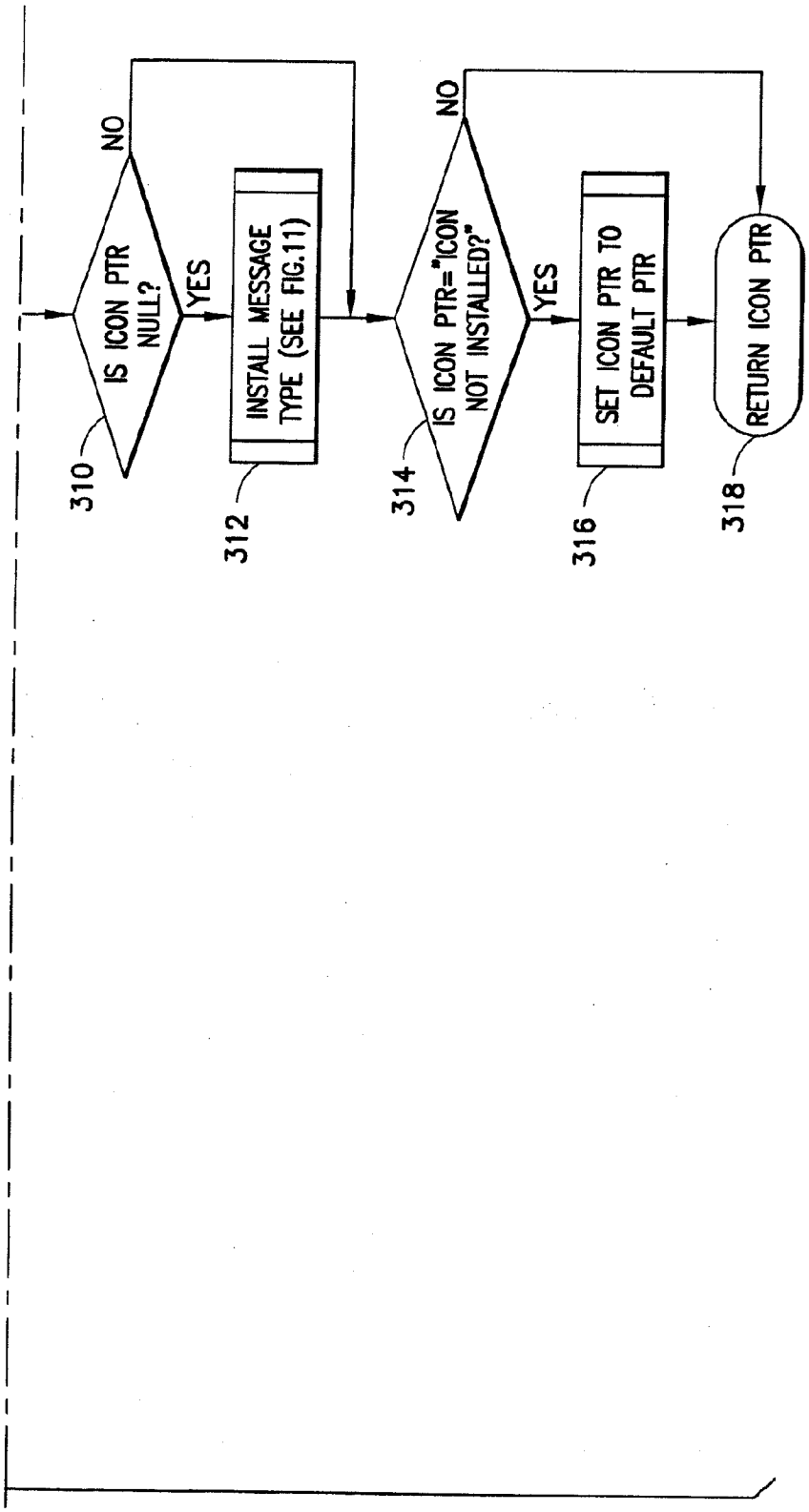
IS ICON PTR NULL?
NO
YES
310
INSTALL MESSAGE TYPE (SEE FIG.11)
312
IS ICON PTR="ICON NOT INSTALLED?"
NO
YES
314
SET ICON PTR TO DEFAULT PTR
316
RETURN ICON PTR
318

FIG.6a–2

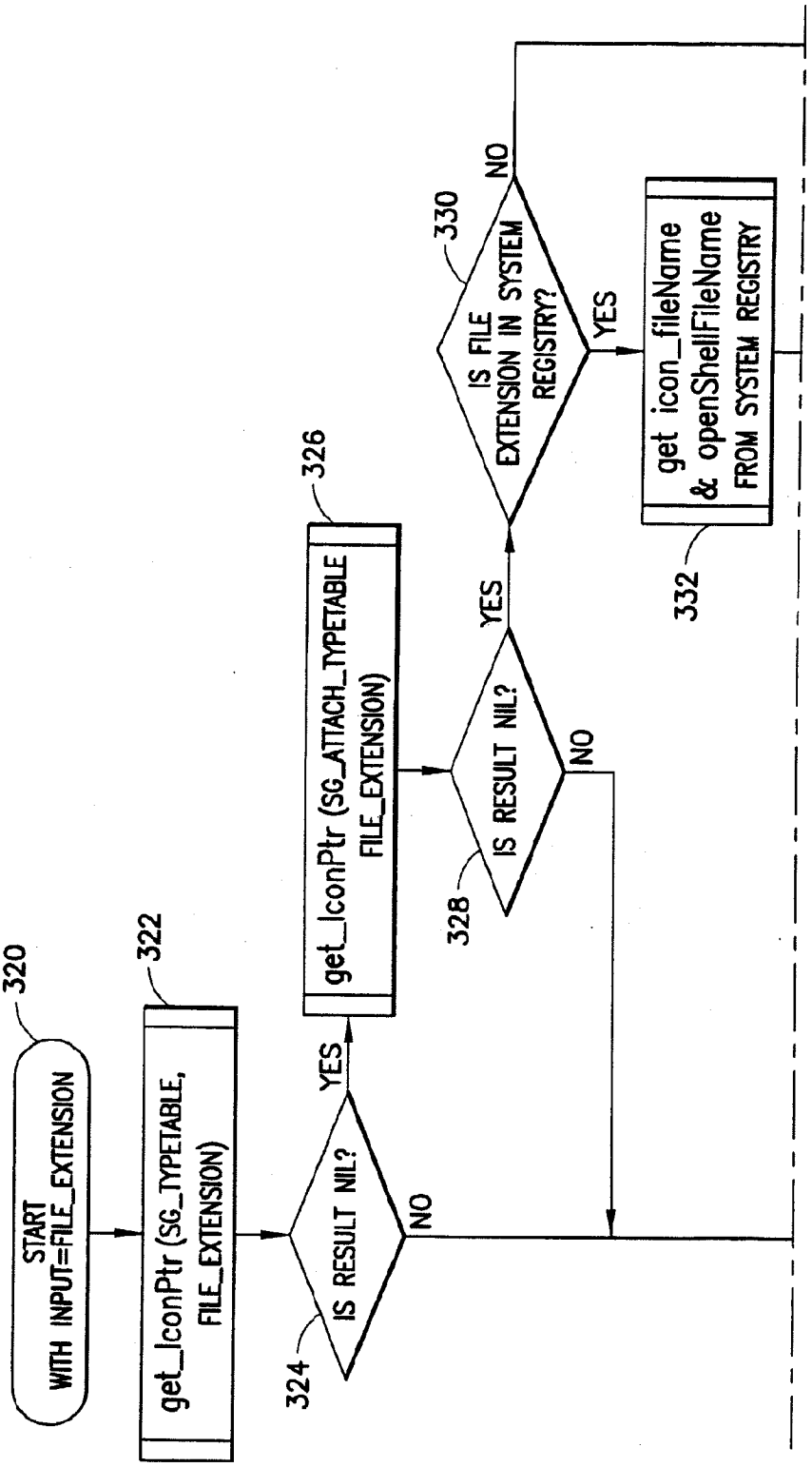

FIG.6b-1

FIG.6b-2

FIG.6b

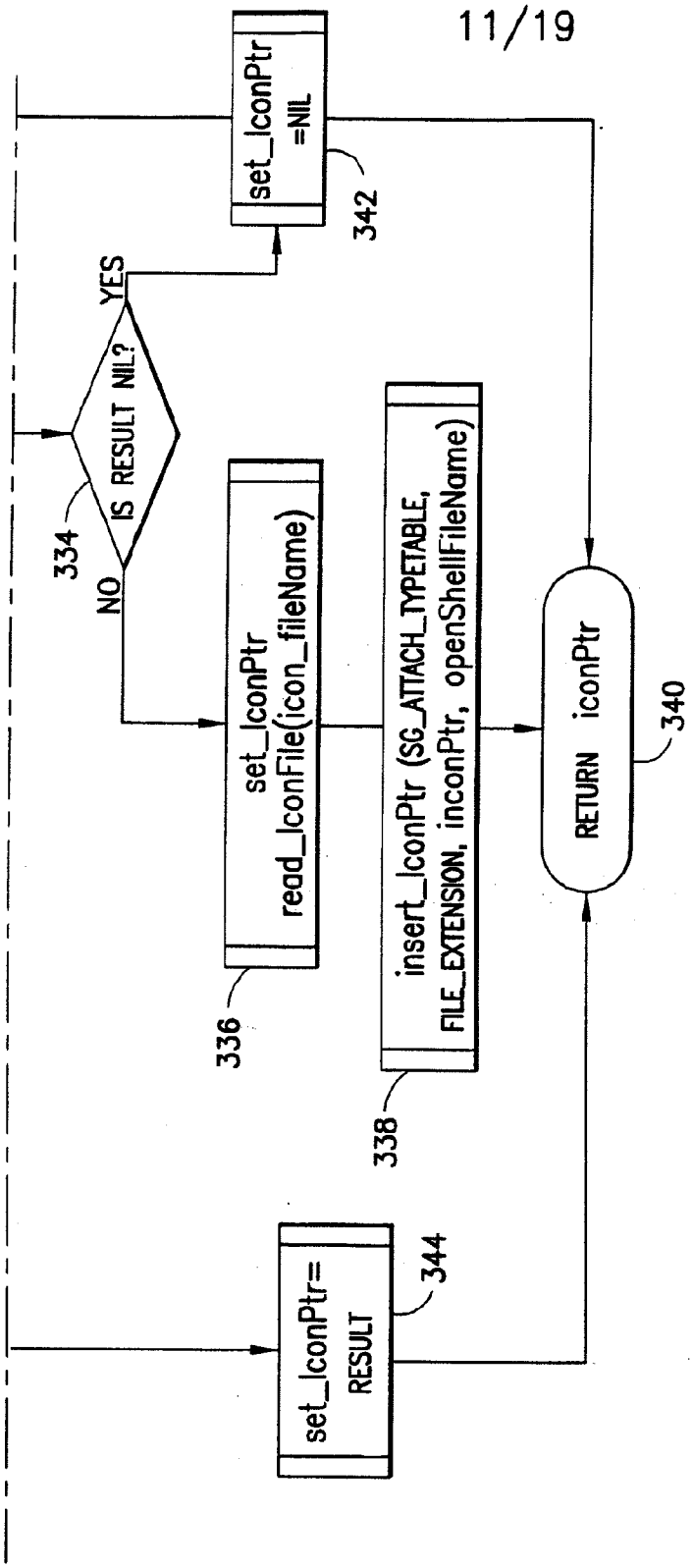
set_IconPtr =NIL
342
YES
IS RESULT NIL?
334
NO
set_IconPtr read_IconFile(icon_fileName)
336
insert_IconPtr (SC_ATTACH_TYPETABLE, FILE_EXTENSION, inconPtr, openShellFileName)
338
RETURN iconPtr
340
set_IconPtr= RESULT
344

FIG.6b-2

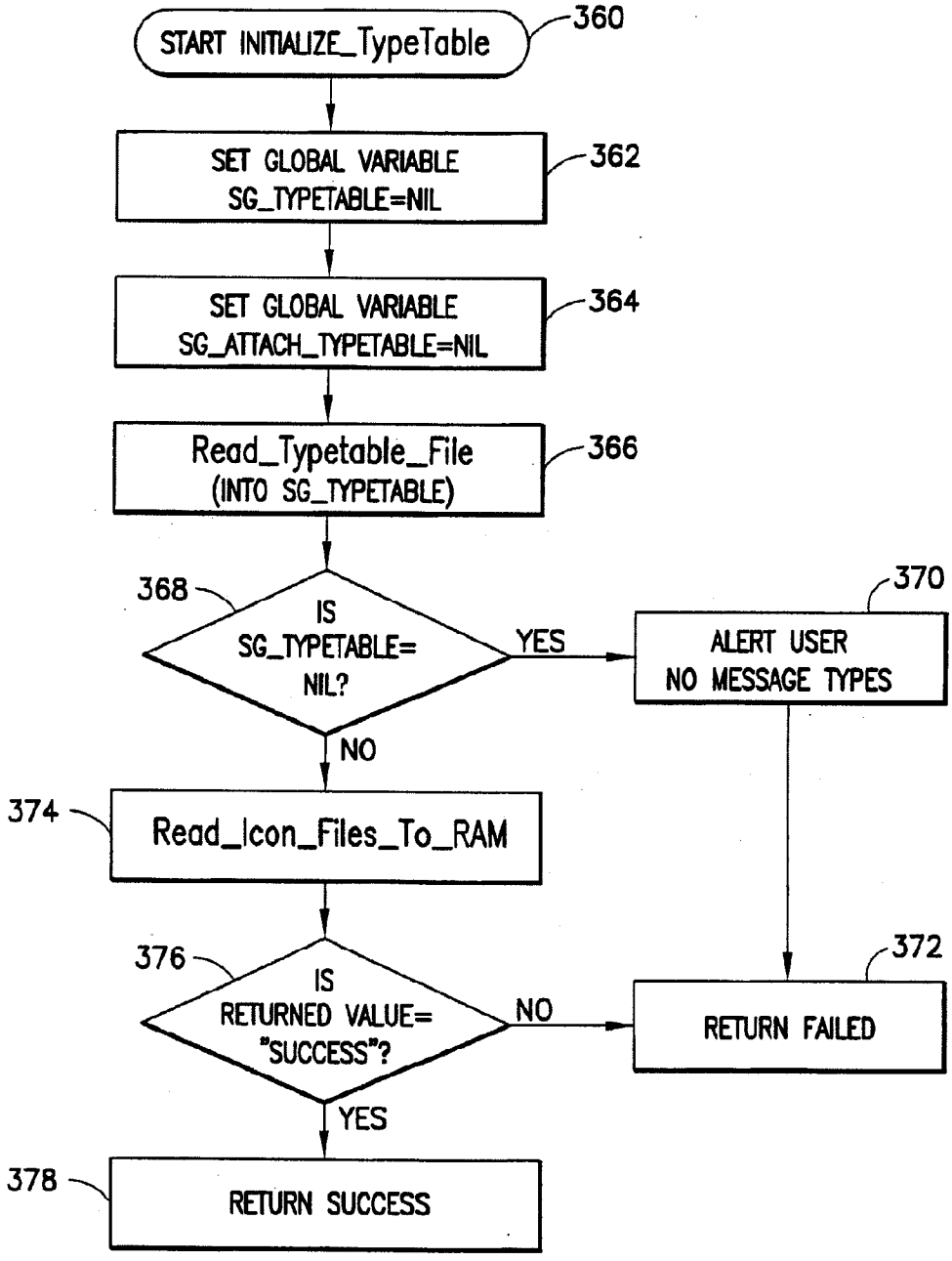
START INITIALIZE_TypeTable
360
SET GLOBAL VARIABLE SG_TYPETABLE=NIL
362
SET GLOBAL VARIABLE SG_ATTACH_TYPETABLE=NIL
364
Read_Typetable_File (INTO SG_TYPETABLE)
366
368
IS SG_TYPETABLE= NIL?
YES
370
ALERT USER NO MESSAGE TYPES
NO
374
Read_Icon_Files_To_RAM
376
IS RETURNED VALUE= "SUCCESS"?
NO
372
RETURN FAILED
YES
378
RETURN SUCCESS

FIG.7

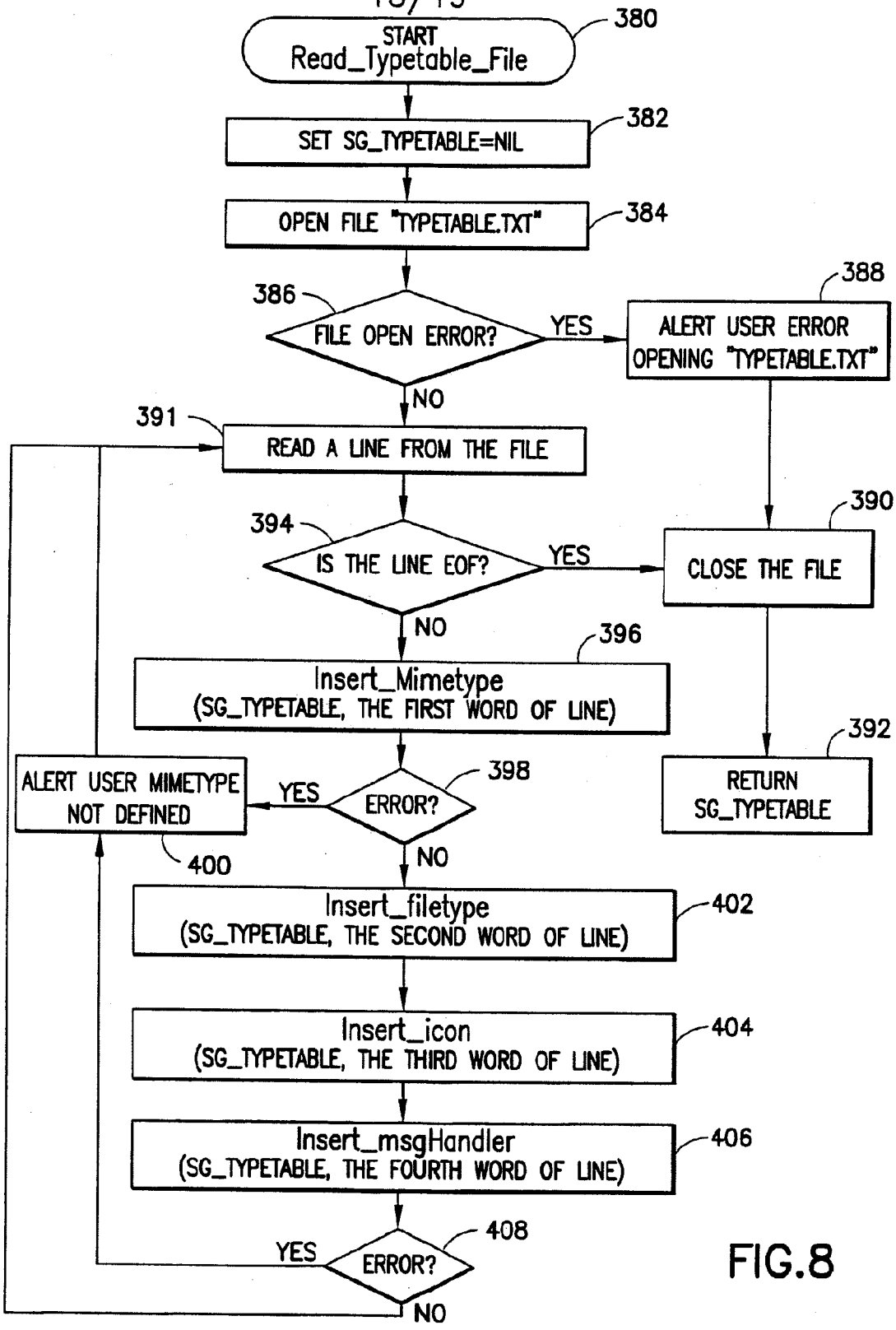
START
Read_Typetable_File
380
SET SG_TYPETABLE=NIL
382
OPEN FILE "TYPETABLE.TXT"
384
386
FILE OPEN ERROR?
YES
388
ALERT USER ERROR OPENING "TYPETABLE.TXT"
NO
391
READ A LINE FROM THE FILE
394
IS THE LINE EOF?
YES
390
CLOSE THE FILE
NO
396
Insert_Mimetype
(SG_TYPETABLE, THE FIRST WORD OF LINE)
392
RETURN SG_TYPETABLE
ALERT USER MIMETYPE NOT DEFINED
YES
ERROR?
398
400
NO
Insert_filetype
(SG_TYPETABLE, THE SECOND WORD OF LINE)
402
Insert_icon
(SG_TYPETABLE, THE THIRD WORD OF LINE)
404
Insert_msgHandler
(SG_TYPETABLE, THE FOURTH WORD OF LINE)
406
YES
ERROR?
408
NO

FIG.8

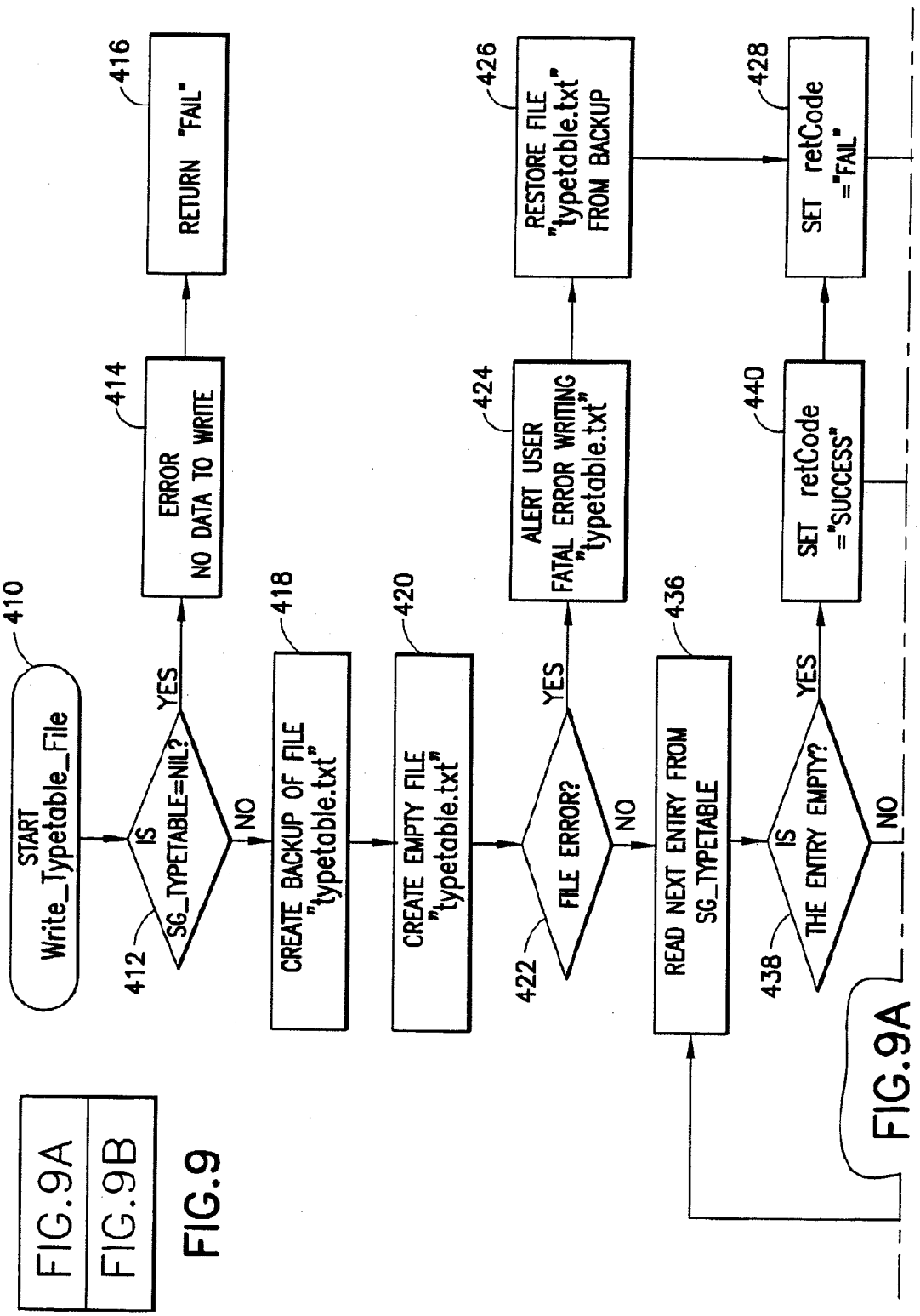

FIG.9A
FIG.9B

FIG.9

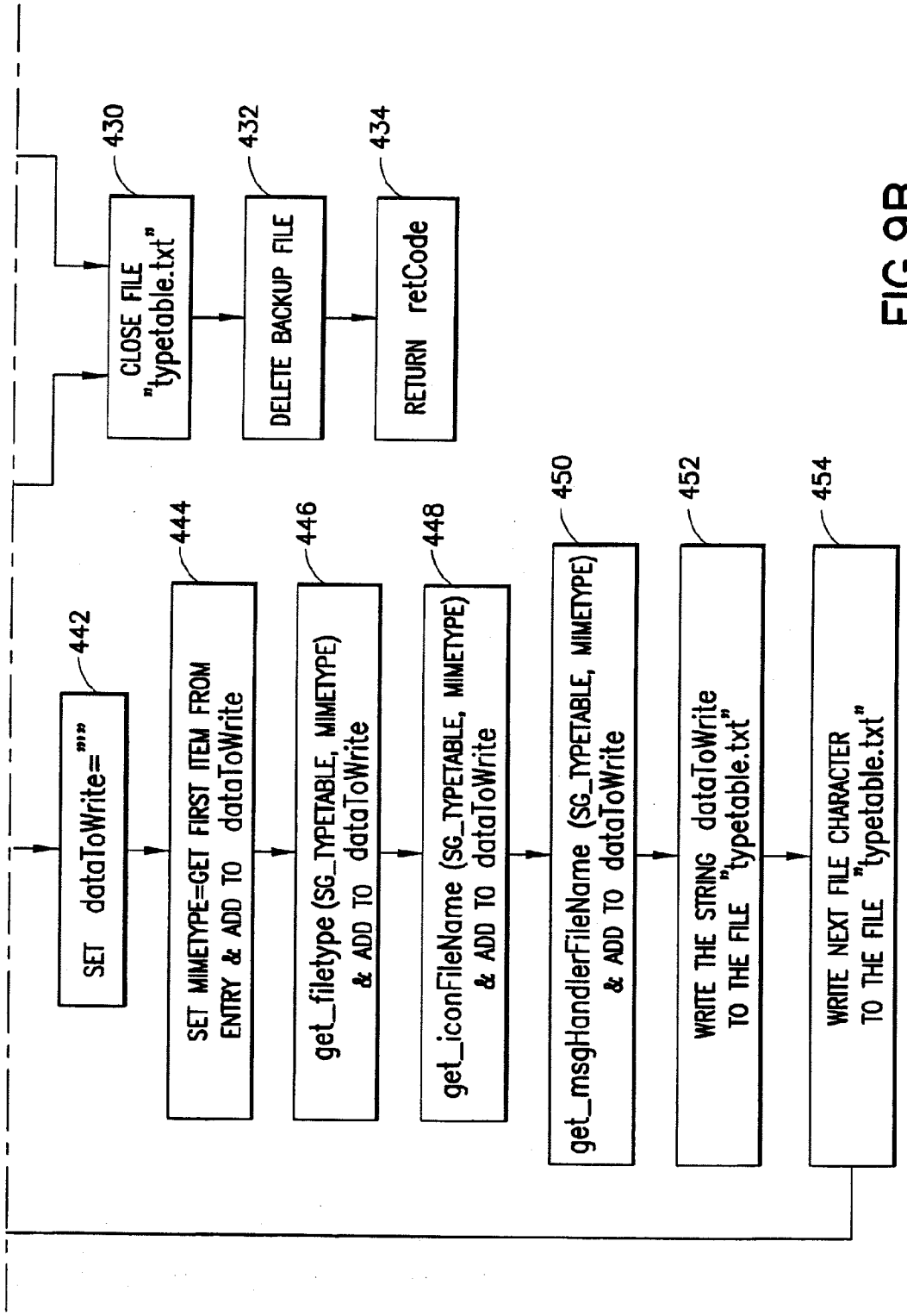
SET dataToWrite=""
442
SET MIMETYPE=GET FIRST ITEM FROM ENTRY & ADD TO dataToWrite
444
get_filetype (SG_TYPETABLE, MIMETYPE) & ADD TO dataToWrite
446
get_iconFileName (SG_TYPETABLE, MIMETYPE) & ADD TO dataToWrite
448
get_msgHandlerFileName (SG_TYPETABLE, MIMETYPE) & ADD TO dataToWrite
450
WRITE THE STRING dataToWrite TO THE FILE "typetable.txt"
452
WRITE NEXT FILE CHARACTER TO THE FILE "typetable.txt"
454
CLOSE FILE "typetable.txt"
430
DELETE BACKUP FILE
432
RETURN retCode
434

FIG.9B

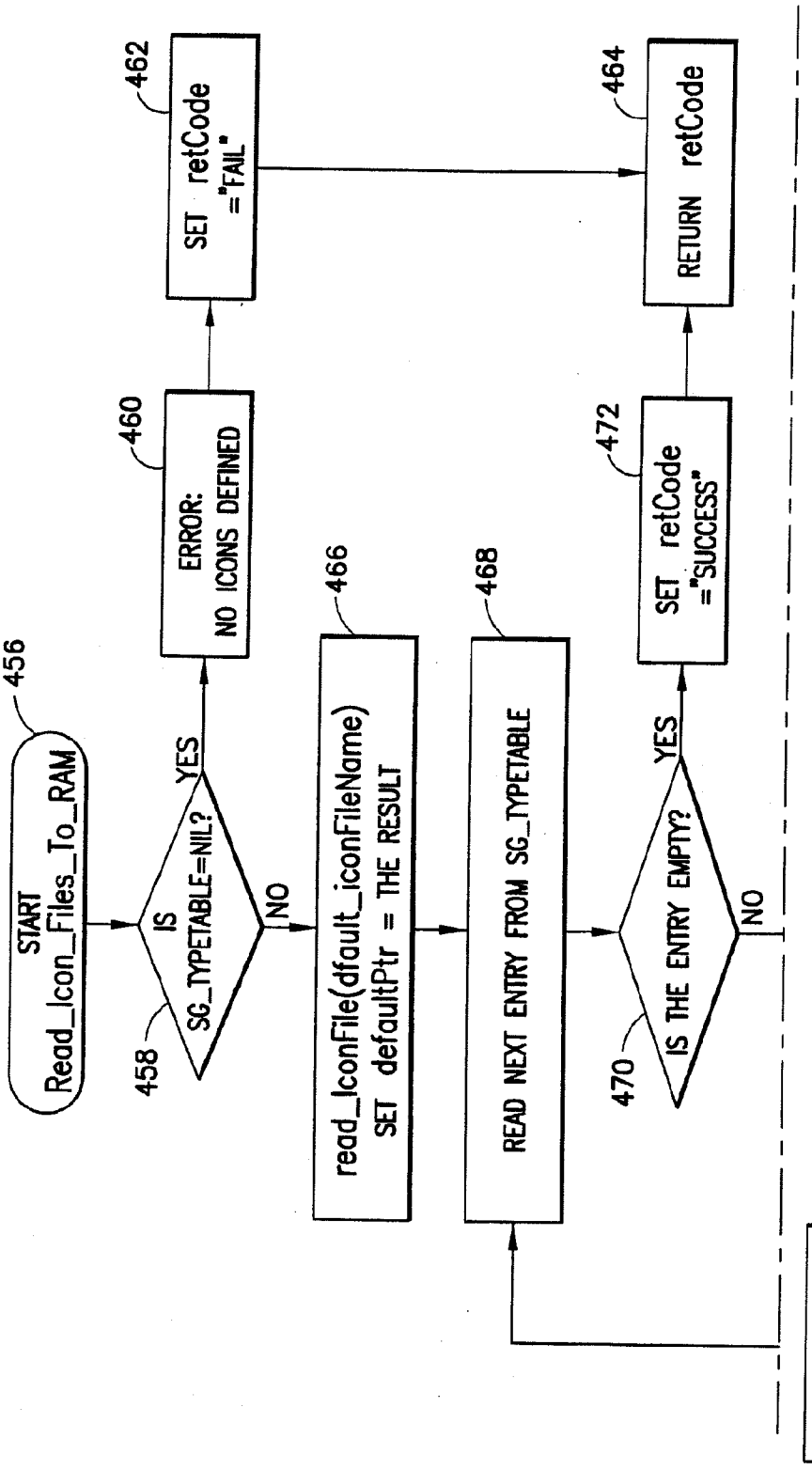

FIG.10A

FIG.10

FIG.10A
FIG.10B

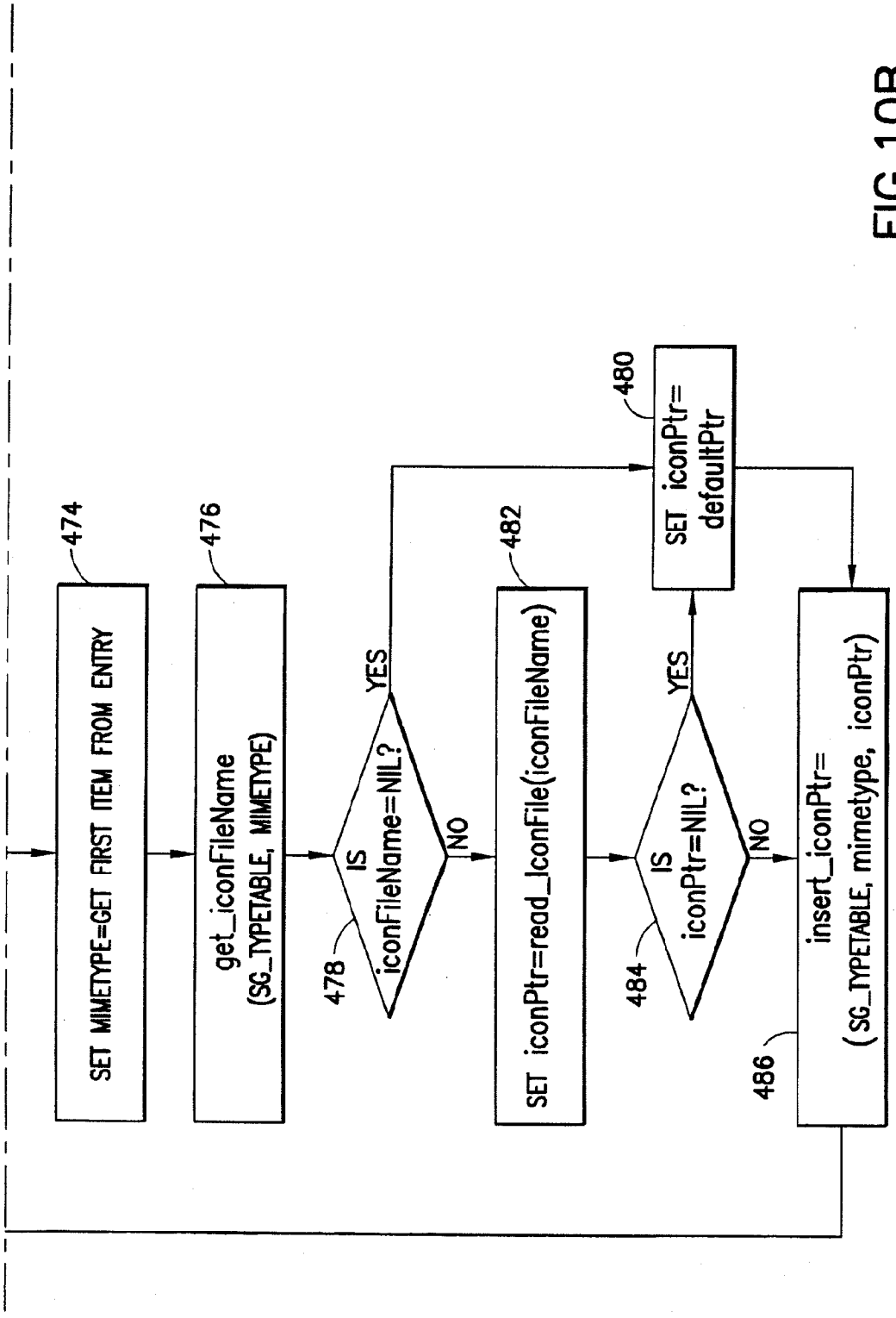
474
SET MIMETYPE=GET FIRST ITEM FROM ENTRY
476
get_iconFileName (SG_TYPETABLE, MIMETYPE)
478
IS iconFileName=NIL?
YES
NO
480
SET iconPtr= defaultPtr
482
SET iconPtr=read_IconFile(iconFileName)
484
IS iconPtr=NIL?
YES
NO
486
insert_iconPtr= (SG_TYPETABLE, mimetype, iconPtr)

FIG.10B

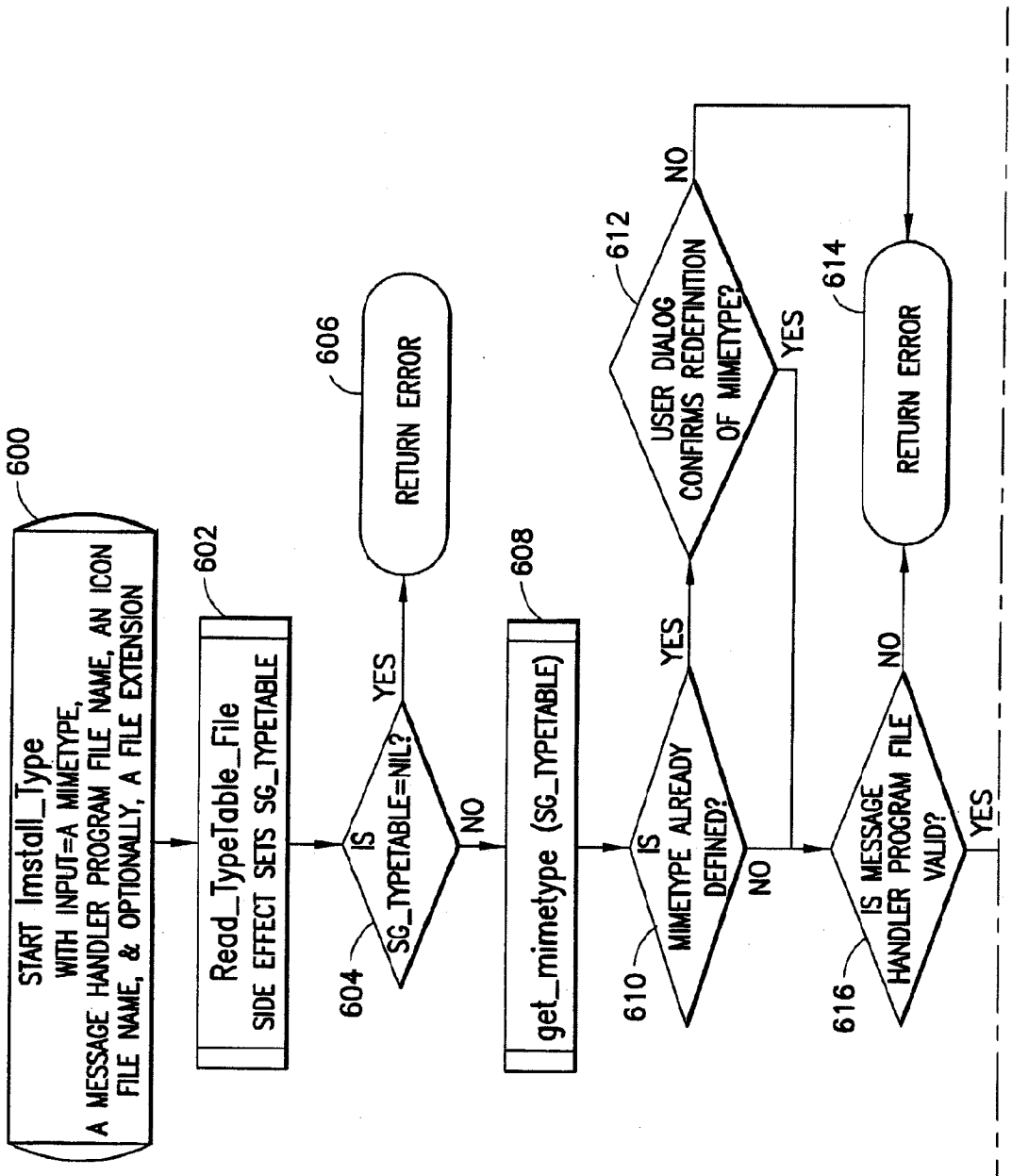

FIG.11A
FIG.11B

FIG.11

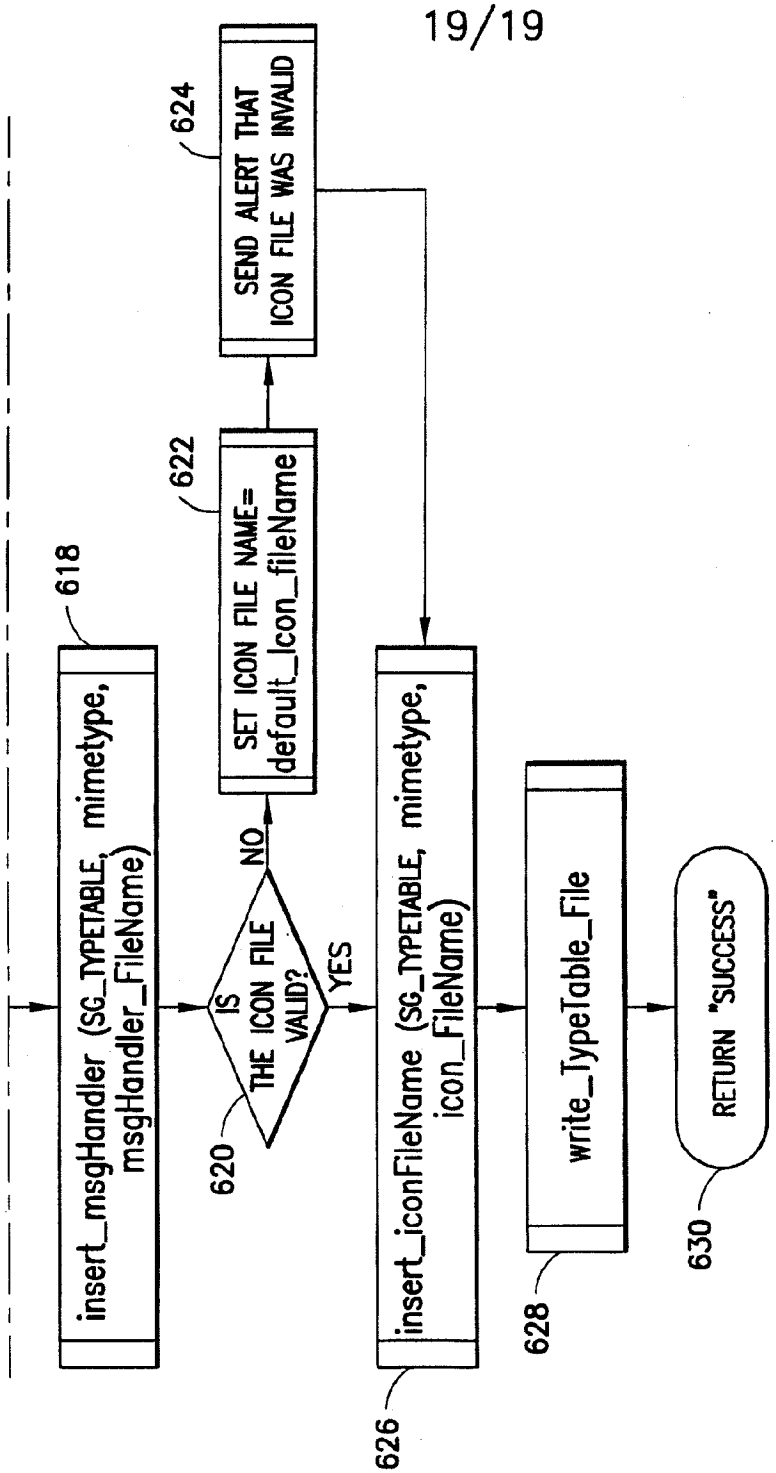
618
insert_msgHandler (SG_TYPETABLE, mimetype, msgHandler_FileName)
620
IS THE ICON FILE VALID?
NO
YES
622
SET ICON FILE NAME= default_Icon_fileName
624
SEND ALERT THAT ICON FILE WAS INVALID
626
insert_iconFileName (SG_TYPETABLE, mimetype, icon_FileName)
628
write_TypeTable_File
630
RETURN "SUCCESS"

FIG.11B

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/20348

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 13/00, 15/16.
US CL :709/206; 345/700.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 709/206; 345/700

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

west

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,E	US 6,092,114 A (SHAFFER et al) 18 July 2000	1-17
A,E	US 6,189,026 B1 (BIRRELL et al) 13 February 2001	1-17
A,P	US 6,073,166 A (FORSEN) 06 June 2000	1-17
A	US 5,752,059 A (HOLLERAN et al) 12 May 1998	1-17
A	US 5,734,901 A (SIDHU et al) 31 March 1998	1-17
A	US 5,826,062 A (FAKE, JR. et al) 20 October 1998	1-17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 10 AUGUST 2001	Date of mailing of the international search report 29 AUG 2001
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Form PCT/ISA/210 (second sheet) (July 1998)*